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ABSTRACT

The teacher-student guide has been developed as a service to schools in an effort to help them organize and operate meaningful courses in apparel manufacturing. For the school it furnishes practical information in implementing the course, such as facility design, equipment requirements, and teacher selection. For the teacher it provides a curriculum guide and instructional material. For the student it provides an interesting introduction to the industry, as well as an opportunity to learn skills that may lead to a career in the apparel industry. A systems approach to facilitate learning and motivate students to develop competencies in apparel manufacturing industry has been attempted. Individualized instructional procedure has been sequenced in eight illustrated units (apparel industry orientation, industrial sewing machine, machine operation, basic machine control, motion economy, basic industrial sewing operations, gauges and folders, and overview of other machine types) to aid students in developing skills and performing tasks required to become competent in a specific job or a series of industrial sewing jobs. The design includes concepts, instructional objectives, learning experiences,and evaluations based on task identifications and analysis. Information on suggested methods of instruction, teacher orientation, and requirements for establishing an apparel manufacturing course are appended. (Author/EC)

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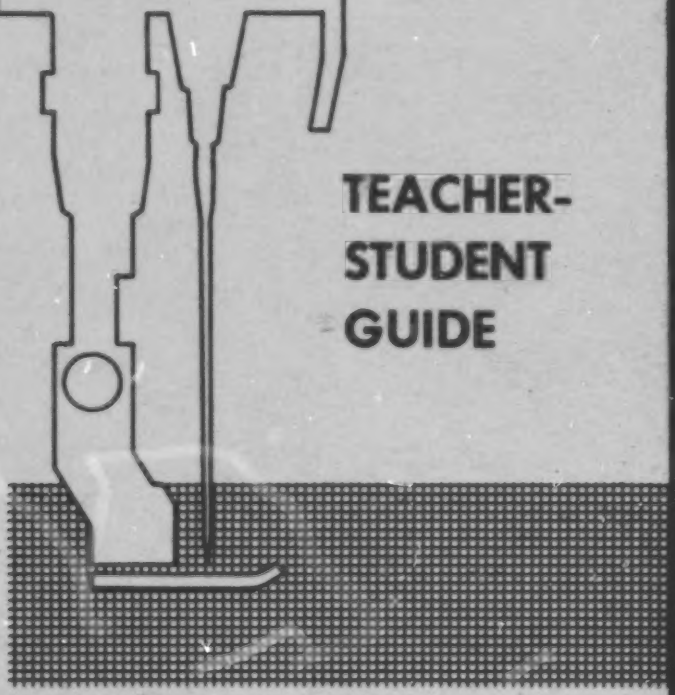
CAREERS IN
INDUSTRIAL SEWING

FOR THE APPAREL MANUFACTURING INDUSTRY



TEACHER-STUDENT GUIDE

CE004927

Published by

The Education Committee
of the American Apparel
Manufacturers Association

and

The
Research and Curriculum Unit
for
Vocational and Technical Education
Mississippi State University

CAREERS IN
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INTRODUCTION

This Teacher-Student Guide has been developed as a service to schools in an effort to help them organize and operate meaningful courses in apparel manufacturing. Realistic information is furnished to aid all segments of the learning environment. For the school it furnishes practical information on implementing the course, such as facility design, equipment requirements and teacher selection. For the teacher it provides a curriculum guide and instructional material. For the students it provides an interesting introduction to a fascinating industry, as well as opportunity to easily learn skills that may lead to a rewarding career in the apparel industry.

A systems approach to facilitating learning and motivating students to develop competencies needed to become successful in the apparel manufacturing industry has been attempted in this learning module. Individualized instructional procedure has been sequenced to aid students in developing skills and performing tasks required to become competent in a specific job and/or a series of industrial sewing jobs.

Teachers will derive great benefit from the effective methods and techniques of teaching that have been suggested by instructional staff members from industry and from the apparel production workers who have shared many innovative work experiences and constructive ideas. (See Appendix A)

Included in the industrial sewing curriculum is basic information that will be helpful to teachers who are aiding students to prepare themselves to become employable in industrial sewing. (See Appendix B) A suggested list of Requirements for Establishing an Apparel Manufacturing Course in Industrial Sewing is included in Appendix C.

The design of this module includes elements such as concepts, instructional objectives, learning experiences, and evaluations based on task identifications and analysis. The course structure was developed from the following educational objectives:

Educational Objectives

After completing the course in industrial sewing, the student will perform satisfactorily the following tasks according to criteria established by the teacher:

1. Identify the major parts of a single needle sewing machine.
2. Safely and skillfully operate and maintain the industrial sewing machine.
3. List orally or in writing the duties and responsibilities of an industrial sewing machine operator.
4. Demonstrate skill and accuracy in handling and stitching materials while operating a single needle industrial sewing machine.
5. Identify and demonstrate general skills that are common to most industrial sewing operations.
6. Explain orally or in writing the piecework incentive pay system.
7. State orally or in writing basic information concerning the history, growth, economic contributions, employment opportunities, manufacturing processes, and working conditions of the apparel industry.

ACKNOWLEDGMENTS

The preparation of this curriculum guide and text has been a cooperative effort by members of the Education Committee of the American Apparel Manufacturers Association (AAMA).

A special word of appreciation is extended to the following organizations for their cooperation in providing reference material, photographs and illustrations which aided tremendously in the development of this course manual:

Singer Company

State of New Jersey Department of Education

Union Special Corporation

Utah State Board of Education

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UNIT I

APPAREL INDUSTRY ORIENTATION

Apparel Industry Growth

The apparel industry is a relatively young industry in America. It had little mass production prior to the Civil War, and it was the early twentieth century before it became a vital part of consumer economy. In recent years with the trend toward improved mechanization, new physical plants and engineered production systems, the manufacture of all types of wearing apparel has moved from the old-time small operation to the present-day industrial complex. Today it utilizes some of the most modern mass-production techniques and latest precision machinery and equipment yet devised.

Because of these improvements, the apparel industry has grown to a position of tremendous importance in the American economy:

a. It is the sixth in number of all manufacturing establishments.
b. It is the third largest consumer industry.
c. It is the fourth largest employer of production workers in all manufacturing.

These statistics come from an AAMA publication entitled "Focus—Economic Profile of the Apparel Industry." The apparel industry is made up of numerous plants that employ varying numbers of individuals. Almost 1.4 million people work in the industry, and about 28% of approximately 25,000 plants employ 50 or more people. Some plants employ more than 500 people.

The apparel industry is composed of some firms that perform all aspects of apparel production, from styling a line through cutting and stitching, to finishing, packaging and shipping the final product to the retailer. Some apparel plants only cut or sew; still others are jobbers who take orders, buy fabrics and find a firm to produce the product. The industry is a prime user of textile products, consuming nearly 50% of the textile industry output.

One of the distinguishing marks of the apparel industry is the keen competition it experiences. It is an industry that has retained most of the characteristics of an open market economy and free enterprise system. The apparel industry also makes a unique contribution to the American economy. Many plants are located in small towns where, very often, they are the only industry in town or at least the largest employer. An opportunity is provided for many people in these small towns to earn important income for their families.

Working conditions in the apparel industry have continually improved. There are many ultra-modern, air conditioned apparel manufacturing facilities today. There are few, if any, industrial health hazards connected with working in the industry, and apparel plants are not polluters of our streams or atmosphere.

Employment Opportunities

Much can be said about products, technology and facilities; however, the apparel industry is also somewhat unique in a very important way—people are important to any apparel company. Unlike many manufacturing industries where machines and equipment produce the product, the sewing industry must have competent and reliable people who take pride in their quantity and quality of workmanship.

While the apparel industry does offer a wide variety of job opportunities, the majority of these require skills needed to operate industrial sewing machines. Approximately eighty percent (80%) of the employees in a typical apparel plant are women who operate industrial sewing machines as assemblers. The apparel industry employs one quarter of all women who work in manufacturing.

Opportunities are ever-present in the apparel plant. For example, the majority of management-supervisors have moved up from the sewing operation. Demonstrated performance can lead to positions of responsibility and advancement.

The industry offers very stable employment for those who enter it, who like the work, and who are trained to be productive workers. While much apparel is seasonal in nature, the industry is not affected by drastic cyclic changes as are some other industries. Industry employment growth has been steady, and 1971 statistics show total employment at about 1.36 million. This growth and the increasing demand for apparel products lead to employment opportunities which offer a great deal of job security.

The Piecework Incentive Pay System

This entire course is essentially aimed at preparing the student to take advantage of good earning opportunities in the apparel industry. Opportunities exist in the apparel industry for individuals to increase earnings as they develop and increase skill competence. The basic concept of an incentive pay system is to make it possible for a person to take advantage of the earning opportunities in this industry. There are several compensation or pay plans in the industry; they are partially or entirely based on the straight piecework system.

The piecework plan is very simple. Piecework plans pay the employee more money as the employee produces more work. For instance, the employer may pay the operator a rate of 30 cents for every "piece" of work completed. This work has to be done by a certain method, with a certain machine, and be of specified quality. The rate the employer pays per piece is determined in advance by studies that show the average amount of time it takes to complete a piece. At the end of the day (usually an eight-hour workday) the employee reports the number of pieces that were completed. The following example explains the system.

In one day 100 pieces were completed, so the employee earned $30.00 that day.

100 Pieces Completed
x $ .30 Per Piece
= $30.00 Earned One Day

Suppose the employee works harder the following day and completes 120 pieces.

120 Pieces Completed
x $ .30 Per Piece
= $ 36.00 Earned One Day

The above examples explain the basic system; it is straightforward and not complex. If the employee produces more pieces, the pay increases.

When a new employee (a trainee) goes to work, she simply does not have the skill or pace to complete 100 pieces. The employer knows that it is unreasonable to expect a trainee to "make production" the first week or, usually, even in several weeks. This is why a trainee is usually paid a minimum amount while learning. For example, one day the trainee earned $15.00.

50 Pieces Completed
x $ .30 Per Piece
= $ 15.00 Earned One Day

Remember, however, that the trainee is paid a minimum amount (usually on an hourly basis) while learning the job. The minimum may be $2.25 an hour. So, for eight hours (one working day) the trainee was paid $18.00

$ 2.25 Minimum
x 8 Hours Worked
= $ 18.00 Paid

Going back to the first example, remember that the operator produced 100 pieces for the first day and earned $30.00 ($.30 per piece times 100 pieces). The employer referred to in the example has set 100 pieces a day as the acceptable production quota for that job. If an operator produces 100 pieces in eight hours, then the operator has "made production," has "made quota" or is a "100% operator." The terminology varies from place to place, but the important thing to remember is that every job has a certain quota that must be reached in order to keep the work moving to the next operation and to earn a good salary. Operators are trained to meet this quota and are encouraged to do more than 100% as their skills and pace increase. (Remember, our operator produced 120 pieces and earned more money.)

During the training period, the example trainee produced 65 pieces and earned $19.50.

65 Pieces Completed
x $ .30 Per Piece
= $19.50 Earned That Day

If the minimum is $2.25 an hour or $18.00 a day, what will the trainee be paid, $18.00 or $19.50? Of course, the trainee will be paid $19.50, because she earned every penny of it! The point is that a true incentive begins when the actual earnings exceed the minimum. The trainee now begins to see that as she increases her production, she will receive increases in pay. The trainee will continue to increase her production until she is at quota or, depending upon the individual, may exceed quota and earn more.

The basic factors to remember in order to understand the piecework incentive system are:

a. Money per piece (bundled in dozens, 100's, etc.)
b. Quota ("acceptable production" or "100% operator")
c. Earned money (pieces completed times money paid per piece)
d. Minimum (a minimum hourly wage that is paid while a student learns)
e. More production equals more money!

The incentive pay system boosts the paychecks for individuals who earn more by increasing their skills and speeding up their production. Each individual can determine the amount of his own paycheck.

The Apparel Manufacturing Process

The production flow in an apparel plant begins when piece goods or fabrics are brought into the cutting room. The goods or fabrics are on rolls, which are put on spreading machines and spread back and forth on long cutting tables as many as 300 ply thick. A marker's pattern layout is used to guide the cutter. A "spread" of 300 ply may yield cut parts for 500 dozen garments. After cutting out all of the parts of a garment, the parts are labeled with identification tickets and sent to the sewing preparation sections, where the smaller parts are normally made ready to be joined and assembled. There are many operations involved in making garments. After a final sewing inspection, the garments are sent to the pressing section where they are pressed, packaged, and shipped.

The sewing machine operator will learn one or more operations on a garment; she does not make the entire garment. An apparel plant is full of operation specialists who are scheduled as a team to make a quality product for prompt delivery.

Additional reference material on the apparel manufacturing process may be found in:

a. Apparel Manufacturing Analysis, by Solinger Publisher, Textile Book Publishers, Inc., New York.
b. Apparel Engineering & Needle Trades Handbook, publisher, Kogos International Corp., 1140 Broadway, New York.

UNIT II

THE INDUSTRIAL SEWING MACHINE

SAFETY RULES, PARTS, SIMPLE ADJUSTMENTS, AND MAINTENANCE

The sewing machine used in a manufacturing plant is an expensive, precision-built piece of equipment. Correct care and maintenance are essential to keep an industrial sewing machine performing properly.

The industrial sewing machine is built to give trouble-free, efficient service, but it must receive constant attention. To prevent frequent breakdowns, perform the following tasks:

a. Clean the machine properly and keep it free of dust and excess oil.

b. Oil the machine properly.

c. Use the proper thread and needle for all work. (An incorrect needle can cause faulty stitches, damaged fabric, and can even damage the delicate parts of the machine.)

d. Call for mechanical assistance when an abnormal sound or action is noticed. (Don't wait until the machine breaks down to call for assistance.)

There are other parts of the machine which also require respect and attention. Most machines have a bobbin winder and other mechanical devices which require regular oiling and adjustment. All moving pieces of equipment which are attached to the machine itself require constant maintenance. Proper care of the machine will help increase operator earnings and career success.

Safety in Industrial Sewing

An industrial sewing machine is a safe piece of equipment, when operated with care and when attention is paid to safety rules. The following are some basic principles that apply to working in any industry. These safety precautions should be taken in the classroom and in industry.

a. Keep Work Area Clean

Each individual is responsible for keeping the work area neat and clean. This means that the aisles must be kept clear of materials that may cause tripping; materials should be piled in such a way that each work station is free of hazards.

b. Develop an Attitude of Safety

You often hear that a person is "accident prone." This really means that the person is, in reality, careless.

Most accidents are caused by persons who have an attitude of indifference, carelessness, or complacency. Complacency comes about when we become so used to what we are doing that we do not concentrate on our work. When you first learn to drive a car, you think about shifting, you think about signaling for a corner, and you think about what the other driver is

about to do. After driving for several years, you drive automatically. Shifting and signaling are automatic; you don't have to THINK anymore. That is one of the reasons why thousands are killed on highways. Do not stop thinking about safety rules when operating an industrial sewing machine. Do not allow complacency to set in . . . be careful; concentrate on the job being performed and avoid accidents and injuries.

Some Specific Safety Rules

The following safety rules should become habits. A safe operator is a good operator. Some of the rules that safe, experienced operators practice and rules that will be followed in the classroom are as follows:

a. Turn off power before adjusting or cleaning the machine. Be sure the motor is completely stopped before proceeding.

b. Turn off power before inserting, removing, or adjusting the needle.

c. Remove foot from treadle before changing or adjusting the needle and before adjusting or cleaning the machine. It is a good, safe habit to keep your feet off the treadle anytime you do not intend to operate the machine.

d. Take proper care of tools and machines assigned to you. Keep the machine properly oiled and clean.

e. Keep the work station neat and the aisles clear.

f. Develop correct lifting and carrying habits.

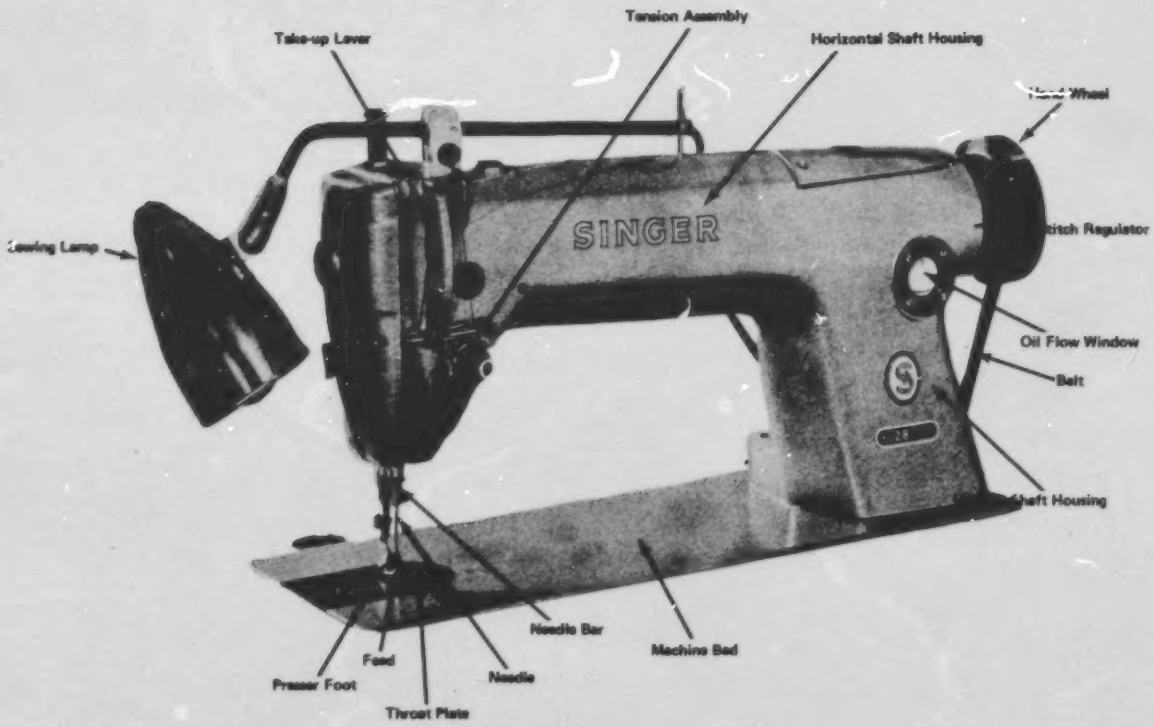
g. Do not engage in "practical jokes" in the classroom or on the job.

h. Do not attempt to operate a machine for which you have not been trained.

i. Use a finger guard on the machine.

General Characteristics of Equipment

What are some of the common characteristics of the hundreds of different machines that sew anything from sheer nylon to heavy shoes, or from the finest laces to army tents? They are all sewing machines, regardless of shape or size, because they all use a needle and thread to penetrate one or more pieces of a textile. Let us examine a popular type of machine so we can learn those parts which are common to many sewing machines.



a. The sewing machine contains the needle bar, which holds the needle, the presser foot, the feed dog, the throat plate, the take-up mechanism, and the tension spring assembly, in addition to other important parts.

b. The horizontal shaft housing supports the sewing machine head and contains the shaft and bearings which drive the moving parts of the sewing head.

c. A vertical or upright shaft housing carries the power from the motor assembly below by means of driving shafts, belts, and rods to the rest of the arm of the machine.

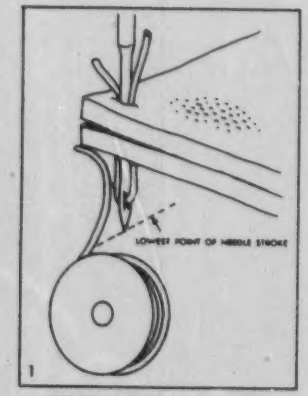
d. Last, but certainly not the least important, is the bed of the machine. This part supports the total parts and functions of the machine and furnishes a cover as well as a mounting for all the moving parts underneath, where you will find the feed mechanism, bobbin case, etc. Later we will take a closer look at these and other parts of the machine.

Straight sewing machines fall into just two main categories. We will consider them individually, except when the parts function identically or when the operation of the machine is similar. The two main categories of straight sewing machines are:

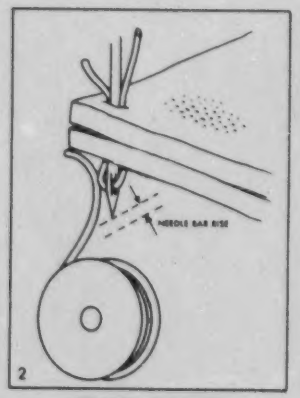
a. The lockstitch—two thread (Federal Stitch Type 301)

b. The chainstitch—single thread (Federal Stitch Type 101) and two thread (Federal Stitch Type 401)

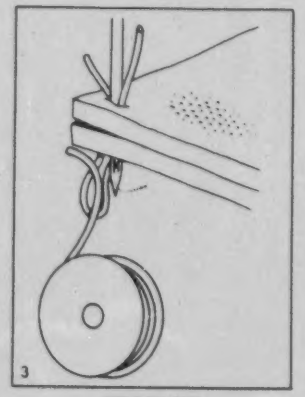
FORMATION OF A LOCK STITCH — (FEDERAL STITCH TYPE 301)



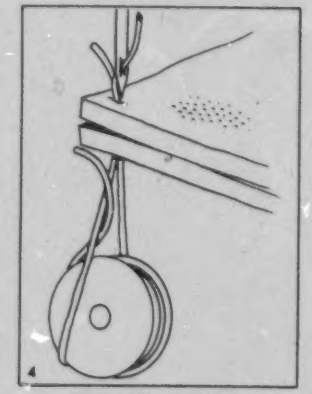
NEEDLE IS AT LOWEST POINT OF STROKE



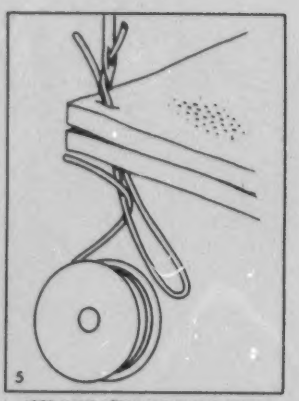
NEEDLE RISES TO FORM LOOP



LOOP IS ENLARGED



LOOP IS PASSED AROUND BOBBIN



LOOP CLEARS BOBBIN AND TAKE-UP STARTS TO DRAW THREAD UP

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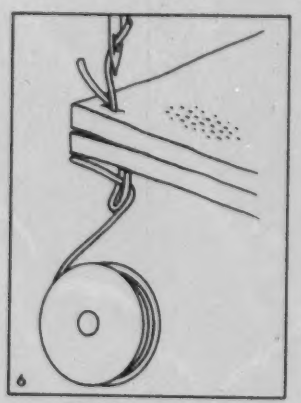
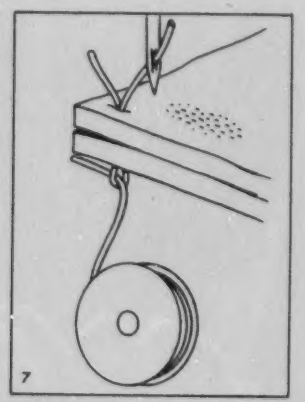
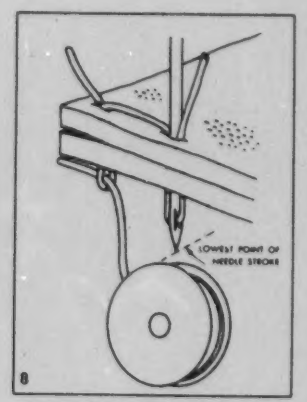


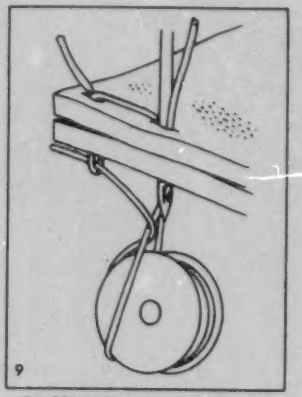
TAKE-UP DRAWS LOOP CLOSED



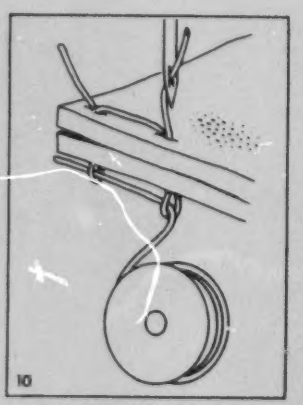
FEED MOVES MATERIAL TO NEXT STITCH POSITION



NEEDLE DESCENDS TO LOWEST POINT OF STROKE

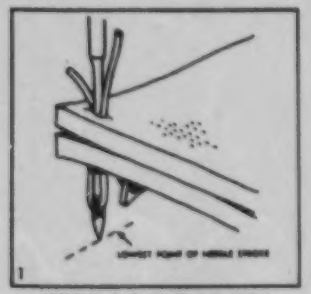


NEW LOOP HAS BEEN FORMED AND IS PASSING AROUND BOBBIN

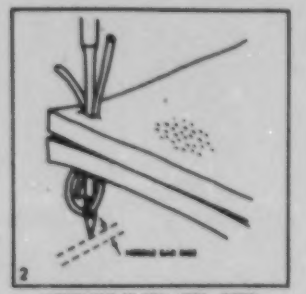


LOOP IS PULLED UP TO COMPLETE STITCH

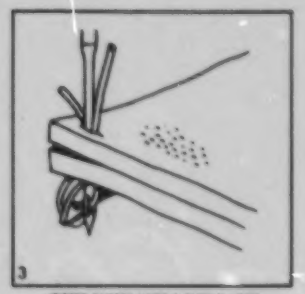
FORMATION OF A TWO THREAD CHAIN STITCH — (FEDERAL STITCH TYPE 401)



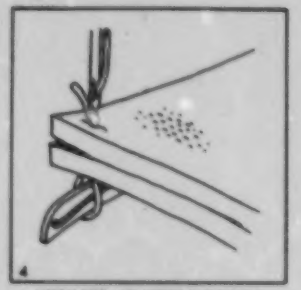
NEEDLE IS AT LOWEST POINT OF STROKE. LOOPER IS ALL THE WAY BACK



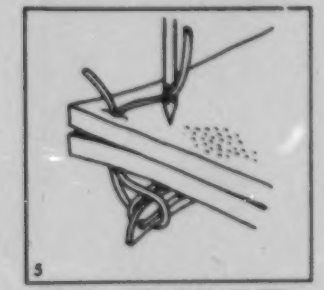
NEEDLE RISES TO FORM LOOP. LOOPER STARTS FORWARD



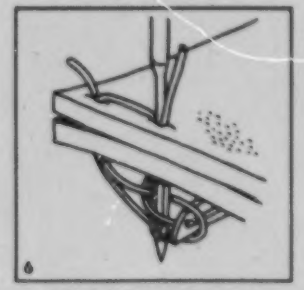
LOOPER ENTERS NEEDLE THREAD LOOP



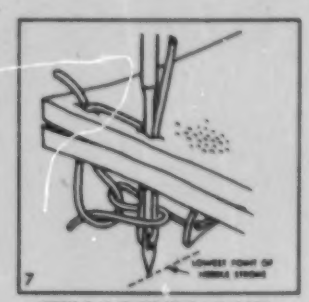
NEEDLE RISES AND LOOPER PASSES FULLY INTO LOOP



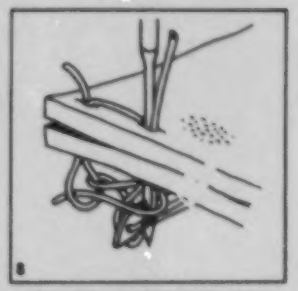
FEED MOVES MATERIAL TO THE NEXT STITCH POSITION AND LOOPER SWINGS TO OTHER SIDE OF NEEDLE WITH AVOIDING MOTION



NEEDLE DESCENDS THROUGH TRIANGLE

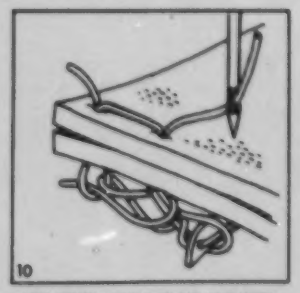


NEEDLE IS AT LOWEST POINT AND LOOPER HAS SHED NEEDLE THREAD LOOP

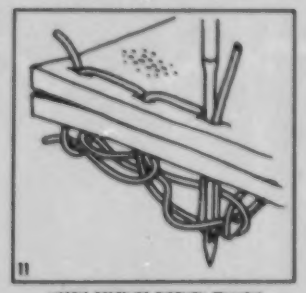


NEEDLE RISES AND LOOPER ENTERS NEEDLE THREAD LOOP

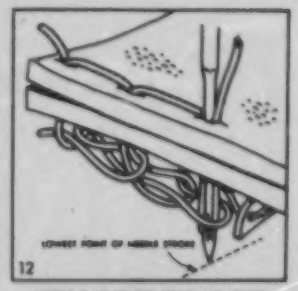
NEEDLE CONTINUES RISE AND LOOPER STARTS ITS RETURN STROKE



FEED MOVES MATERIAL TO THE NEXT STITCH POSITION AND LOOPER SWINGS TO OTHER SIDE OF NEEDLE WITH AVOIDING MOTION



NEEDLE DESCENDS THROUGH TRIANGLE



NEEDLE IS AT LOWEST POINT AND LOOPER HAS SHED NEEDLE THREAD LOOP

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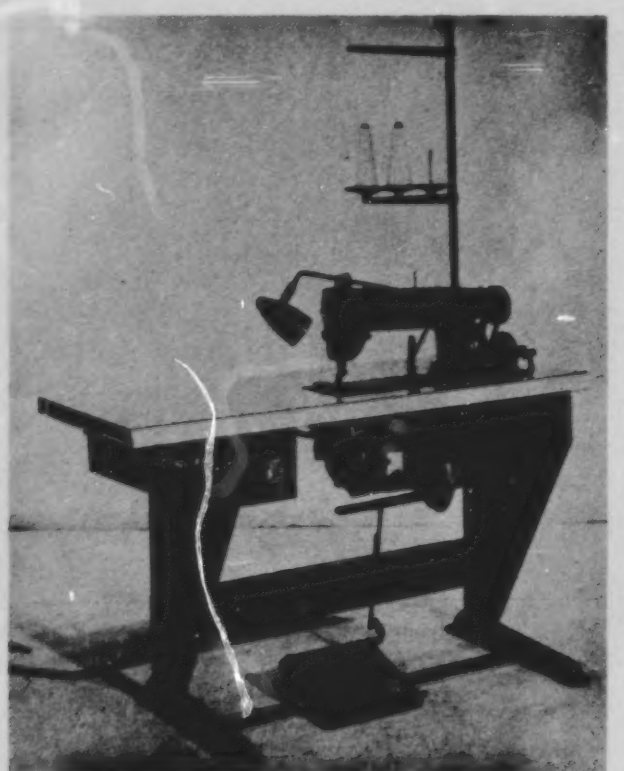
The lockstitch and chainstitch machines contain specific parts, such as: thread tension devices, needle bar, presser foot assembly, feed dogs, throat plates, sewing hooks, take-ups, bobbins and bobbin cases—only on lockstitch machines, and loopers—only on chainstitch machines.

You will find some parts which we have not discussed. The main reason for not discussing them is that they are the concern of a mechanic. You will study all of the parts that an operator should know, either because you may have to oil and adjust some of these parts, or because their function will affect your operating the machine.

The Industrial Machine

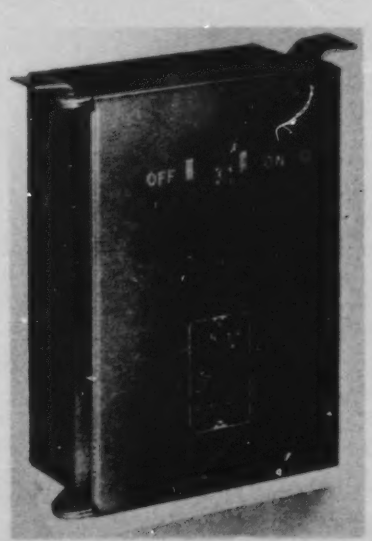
Industry is very demanding of the equipment it uses. Therefore, the industrial sewing machine is a precision instrument and differs from the machine you may have at home in that it is made stronger, heavier, and various shapes and operates at speeds many times higher than the domestic home machine.

The machine parts, simple adjustment and maintenance should be demonstrated by the instructor during the study of this unit. After study and demonstration, students should be allowed to practice such things as threading top and bobbin of their machine and changing the needle. These exercises should be performed to timed targets to build speed, since these functions reduce production time.



a. Common Parts and Their Use

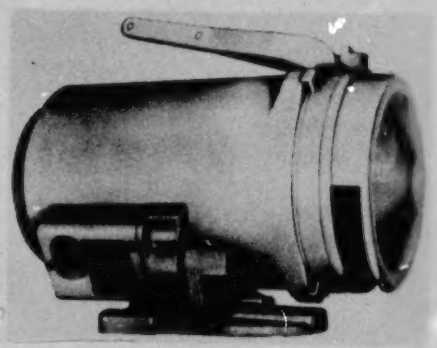
(1) Under the table is the switch. This is like a light switch. You turn the power ON when you want to sew. (Always turn the power OFF when you leave the machine.)



(2) The kneelift hangs under the table. You will learn how to use the kneelift later. It is used to raise and lower the presser foot.

(3) On the base of the stand is the treadle for controlling the machine speed. When you step on the treadle, the machine starts to work. To stop the machine heel the treadle. This acts as a brake.

(4) Under the table is the electric motor. The motor gives the machine the power to sew. As in an automobile the motor furnishes the power to turn the parts of the machine.



(5) In the back of the machine is the thread stand. The stand holds the thread supply in a position where the machine can pull it off the cone or spool as needed.

(6) The presser foot holds the material in place from the top. The stitches are formed as the needle goes up and down in the opening in the presser foot.

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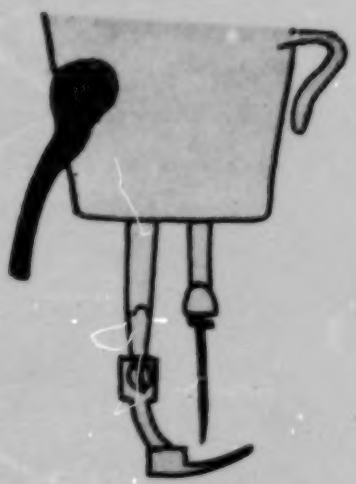
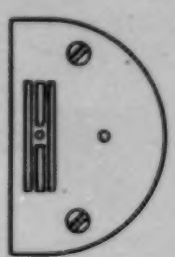
(7) The manual presser-bar-lifter is used to release the presser-bar and foot. The knee or foot lifter usually performs this function. (The manual lever is seldom used on industrial sewing machines, and some do not have them.)



(8) The feed dog is part of the feeding mechanism that rises and falls above and below the throat plate, causing the material under the presser foot to advance one stitch length for each needle penetration.

(9) The throat plate is a piece of metal on which the presser foot rests. The feed dog moves up and down through the slots in the throat plate. It supports the material under the presser foot.



(10) The light is mounted on the machine head or on the machine table. (Always use the light when you work. The light should shine in the area of the needle so that you have a good view while you sew.)

(11) The hand wheel can be used to position the needle. It should be turned in the direction of the operator. (Caution: Do not touch if wheel has started rotating.) After much training, the professional machine operator does not touch the hand wheel, but like an artist, controls the needle position with a light touch on the foot treadle.

(12) The stitch regulator is used to adjust the length of the stitches. The number of stitches per inch determines the stitch length. Stitch regulators vary greatly with the make and type of machine. Do not attempt to set the stitch regulator until you have studied the Instruction Manual supplied with the machine. (The machine must be stopped, and the motor must be turned off before attempting to change stitch lengths.)

b. Lubrication

Many sewing machines are self-oiling and have an oil gauge that you can see, if you have enough oil in the machine. Others must be oiled manually using an oil can. Every machine manual has a picture or diagram that shows the oiling points on the machine. Some oiling holes are painted red. Other oiling holes are pointed out by arrows or the word "oil."

When you oil a machine, put the top of the oil can above the hole. Press the bottom of the oil can with the thumb and permit a few drops to pass into the oil hole. See the manufacturer's manual for oiling instructions.

c. Cleaning the Machine

Any precision piece of equipment must be kept clean in order to perform efficiently. The build-up of lint and dirt under the throat plate and around the stitch-forming parts must be removed. The frequency of removal will depend on the types of material being stitched. It is a good practice to remove the throat plate and brush out the accumulation around the feed dog and stitch-forming parts at the end of each day. A good, round, fairly stiff paint brush is ideal for this type of cleaning. Use it gently, but firmly.

d. Machine Familiarization

(1) Principles and Function of the Presser Foot

Without a presser foot, the machine will not sew. After the needle has penetrated the material and started on its upward stroke, if it were not for the presser foot, the material would rise with the needle, and the machine could not make a stitch. When the presser foot is loose, the machine will not make stitches in the material; this is known as "flagging" of the material. When material flags, it prevents the proper motion of the needle thread loop below the throat plate. Therefore, the prime function of the foot is to exert enough pressure on the material so that it will not flag and also to provide a smooth surface against which the material can slide forward when the feed dog rises and starts its feeding motion.

The pressure must be just right. The operator must therefore adjust the pressure when there is a change in the thickness of the material being sewn, or at times when either the material is flagging, or the teeth of the feed dog are cutting the underside of the material.

The presser foot is connected to the end of the presser bar, which runs up through the sewing head. It receives its tension or pressure from a coiled or flat spring controlled by a thumb or slotted screw. Every machine has an adjustment screw for the presser bar, and it will be found in different places and in different forms on different machines.

In normal sewing position the presser foot is always down, which means that it is pressing against the feed dog and the throat plate. However, it is necessary to raise the foot when putting in or removing material, and this is accomplished by using the kneelift. The kneelift lifts the presser foot by the action of your knee. This frees the operator's hands and allows the operator, without stopping the machine, to perform other operations, such as backstitching, sewing around sharp curves, or other maneuvers when the pressure on the material must be relieved slightly.

If you want to raise the presser foot for a longer period of time—for example, when you are cleaning the machine—you should use the manual presser-bar-lifter, which is usually found on the back of the sewing machine head. This lever can be locked open so that the hands can be free.

If we were to try to list every known type and variety of presser foot that has ever been used, we could probably fill another volume. It is enough to say that the presser foot, like most parts of our machine, must perform a particular operation and therefore is designed to cover a specific situation.

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(2) Principles and Functions of the Needle

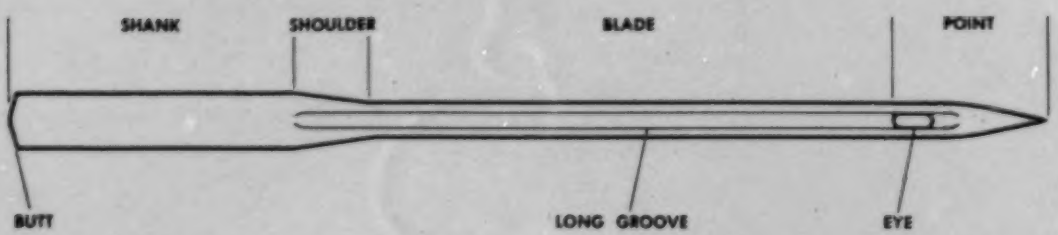
The function of the needle is to penetrate the material and carry the top thread to the loop taker below the throat plate for forming the stitch.

Every sewing machine requires a needle of a specific design made to fit the machine. The shank must be of the right diameter in order to fit the needle bar. The distance from the butt (top of the needle) to the top of the needle eye must be a specific distance in order to place the needle thread loop in the proper place.

The blade must be the right shape and the grooves properly designed to protect the thread as it passes through the material. There is a groove in every needle that runs from the bottom of the shank to the eye. The groove goes straight down the needle and provides a channel for the thread to lie in on its way down through the material.

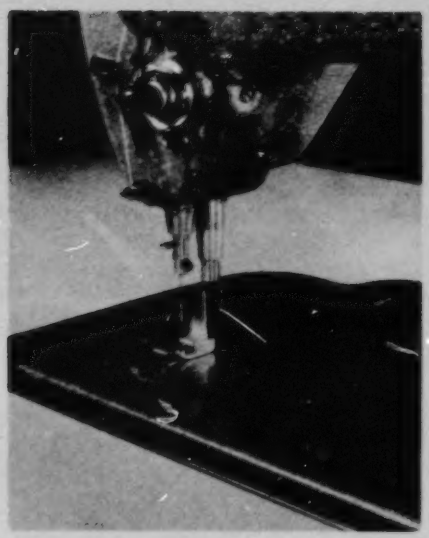
A bent or burred needle is as annoying as a broken needle. Sometimes the strain on the needle is only enough to bend it, and you will be lucky if it bends enough so that the bend is visible. Many times the bend is so slight that you cannot detect it, unless the needle is removed from the machine and rolled on a flat surface. A bent needle will prevent the machine from sewing properly.

A burr means that the point of the needle is rough, and instead of separating the fibers as it penetrates, it will tear or chew them. A needle will burr very easily. Pressing a needle on a hard surface may cause it to burr.



(a) Changing Needles

Loosen the needle set screw and take out the defective needle. Closely check the position of the needle as you remove it. Insert a new needle, being sure that the shank is all the way up into the needle bar. Be sure the needle is in the correct position and straight as shown in diagram. Note in the following picture, the needle is threaded from left to right. Always thread a needle from the long groove side. In the illustration the long groove side of the needle is to the left. After the needle is changed, turn the hand wheel very slowly in the operating direction to be sure the needle does not hit or rub anything.



(b) Needle Size

There is no standard for classifying needles that would enable you to know what needle goes with each machine unless you have the instruction manual at hand. Each manual states the class or type needle used with the particular machine and also states the sizes that are available.

The needle size is numbered according to the overall thickness of the blade. The lowest number represents the smallest size needle. As the size and number increase, so does the thickness of the needle. Many needles are available in sizes from 7 or .022 up to about 28 or .084. We find that the average range for needles used for sewing apparel will run 12 or .032 to about 22 or .054. The 12 or .032 size needles are used on silks, fine cottons, or other delicate fabrics; the 22 or .054 sizes are used on heavy materials such as duck, canvas, or coated fabrics.

Other numbers or letters used to describe a needle take into account other features, such as:

1. Length and thickness of shank
2. Length of blade
3. Size and shape of grooves
4. Size and position of eye
5. Length and shape of the point

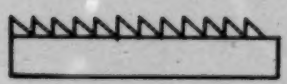
(Supervisors normally determine the correct needle for your machine or job.)

(3) Principles and Functions of the Feed Dog

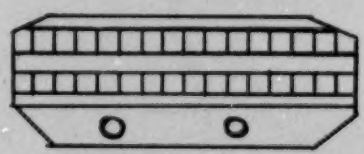
The principal function of the feed dog is to "feed" or move the material the desired distance between stitches. Since it makes one forward motion for each stitch made, the length of the forward motion becomes the length of the stitch. This is usually stated as stitches per inch or S.P.I. Every machine is provided with a stitch regulator so that the stitches can be set to manufacturing specifications, which will normally vary from 8 to 22.

By turning your machine hand wheel, you can see the action of the feed dog as it rises at a point nearest you so that the teeth are above the surface of the throat plate. The feed dog then moves away from you toward the rear of the bed, maintaining an even height until it reaches the end of its stroke. It drops down to continue its circular motion back toward you and again rises to make another "stroke."

We as operators are concerned with the individual teeth, since they must be sharp enough to engage the material on the forward stroke, but not so sharp that they will cut the material. Dull teeth will not engage the material on the forward stroke but will result in the material slipping forward or even sidewise, thread breakage, and skipped stitches. Examine the teeth on the feed dog periodically to be sure that they are in perfect condition. If they are not, call your supervisor or mechanic.



Side view of feed dog showing set of teeth



Feed dog showing two rows of teeth, 8 to an inch

The height, width, and number of teeth per inch are determined by the work to be performed. Usually the overall size and shape of a feed dog must be compatible with the throat plate on the machine.

e. Threading a Sewing Machine

Every machine manufactured has a definite number of threading points. The thread must go in, around, over, under, or through these points in order to deliver the thread at the needle under a specified tension.

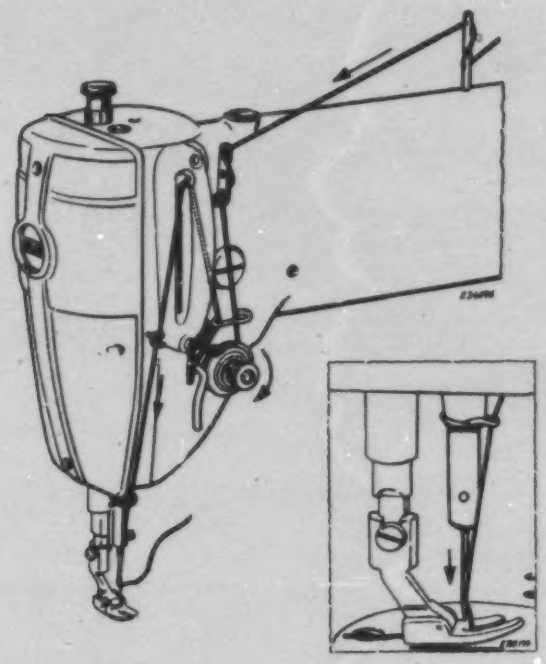
If you skip any of these points in threading a machine, it will probably sew, although it will not always sew as efficiently. If you skip enough points or even one or two important ones, the machine will not sew.

As a rule, most machines will follow a general pattern of threading. Since all thread must first come from the spool, it is very important that the thread be drawn over the guide which is on the thread stand directly above the spool. This is one point you cannot skip. This guide's particular job is to see that the thread is unreeled with the least amount of friction.

The thread is then drawn onto the machine to a thread post which is usually to the right side of the head. There are holes in this post for the thread, and quite frequently the thread will be drawn through one hole, and then through another hole in the same post before it proceeds to the next point.

The next point is another thread post, usually in a horizontal position, with the thread coming out just over the tension disc. After going in between the tension disc, it must go over some kind of post in such a way as to force the thread against the check spring, then through a take-up lever, and down through several guide eyes to the needle eye. Be sure

that the needle is threaded from the proper direction. Always thread the needle from the side of the needle with the long groove. The long groove of the needle is placed in the direction of the last thread guide. Machine manufacturers furnish threading diagrams for all machines.



Upper Threading *Threading the Needle*

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The above threading instructions and illustrations are intended only as a general guide. Remember, each machine has a definite threading procedure, so it is necessary to find the right procedure before you thread any machine. Skipped stitches and broken thread can easily be caused by faulty threading, so always check your threading if these troubles appear.

Lockstitch machines always have a bottom thread that comes from the bobbin. Good threading procedure would include checking the bobbin to see that the thread is unreeling properly.

Chainstitch machines do not have a bobbin, but if the machine has a threaded looper, you must follow the instructions to see that this thread is fed properly into the eye of the looper. Many machines with threaded loopers require special tools because of the inaccessibility of some threading points.

f. The Bobbin Winder

Most lockstitch machines will have a bobbin winder mounted at the extreme right of the machine, and it is adjacent to the machine belt. Once you learn the working and function of any one lockstitch machine, you can apply that knowledge to all lockstitch machines.

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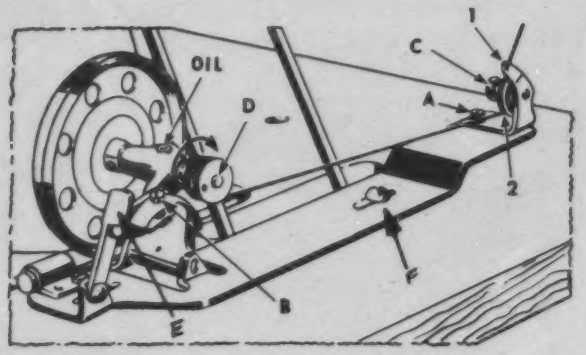

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A bobbin winder should be positioned so that when you push the lever (E) forward, the pulley should touch the belt with enough pressure to cause the bobbin to wind firmly. The set screw (F) can be loosened to position the winder. Once the set screw is in the right position, it is rarely necessary to change. The thread is fed in by first bringing it over the thread guide on top of the spool stand and down through hole No. 1, then around the back and between the tension discs, emerging at point No. 2. The tension should be sufficient to keep the thread taut. There is an adjustment screw (C) on the tension assembly which functions in the same way as any other tension screw. From point No. 2 the thread end is wound around the bobbin a few times in the direction that the bobbin will turn. You are now ready to push the lever (E) forward, and the bobbin will start to wind when the machine is operating. If you find that the thread is not spreading evenly over the spool, loosen screw (A) and turn the tension bracket in either direction until the thread winds evenly over the bobbin.

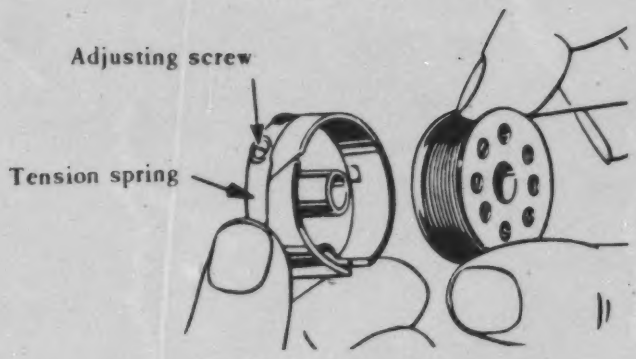
Screw (B) controls a spring which determines the amount of thread to be wound on the bobbin before it releases the lever and stops winding. An over-wound bobbin will not fit into the bobbin case. Be sure that the spring is adjusted so that it will release the lever at the exact moment when the bobbin is wound to its fullest.

g. The Bobbin

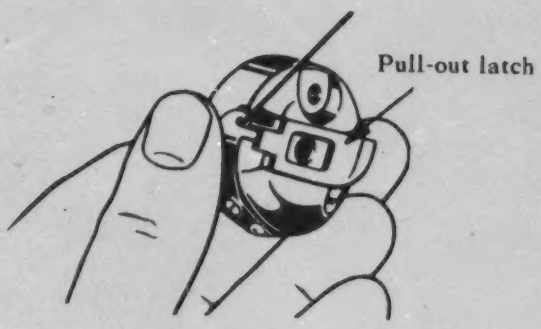
Every machine must use a specified size bobbin and bobbin case. They are interchangeable within one class of machines, but they are not always interchangeable with other classes of machines.

Since bobbins can carry only a limited amount of thread, wound bobbins must always be on hand to use as quickly as they are needed. Unless the factory provides pre-wound bobbins, each machine is equipped with a bobbin winder that winds new bobbins at the same time you are sewing. In this way you do not lose sewing time in order to wind bobbins. There is a considerable amount of friction between a bobbin and a bobbin case, and it is important that all surfaces be smooth and free from anything that can snag the thread being unreeled. A bobbin or its case can be so worn from friction that it will cause a wobble in assembly. This will lead to thread breakage, and the parts should be replaced immediately.

The bobbin case has several parts which must be examined regularly if your machine is to sew properly. Perhaps the most important part is the tension spring, which controls the tension of the thread as it leaves the bobbin.



A wound bobbin being placed in its case.



Threaded bobbin case

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If you look at the drawing of a threaded case, you will find that the thread leaves the case through a hole after it passes under the spring. The tension spring is usually held by two screws; one is always tight, and the other is adjustable and will allow you to tighten or loosen the spring tension.

The other main part of a case is the latch or pull-out lever. This is hinged with a spring and is needed to remove or replace the case in the machine.

The bobbin is really only a part of the "hook" assembly, which includes the bobbin, the bobbin case, and the rotating hook. If you turn the hand wheel and watch the action of the "hook" assembly, you will see that the bobbin stands still while the hook rotates around it.

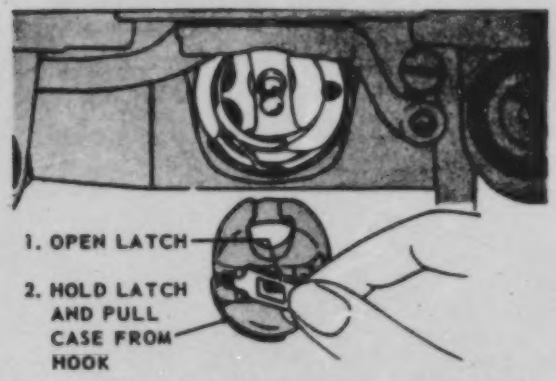
In order to sew, the machine must first make a needle-thread loop, which is formed after the needle has penetrated the cloth and started up again. It is at this point that the point of the hook must engage the loop.

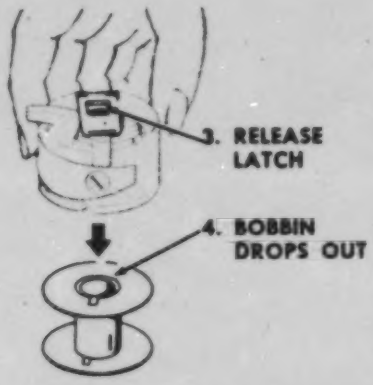
You will hear expressions such as "timing the hook," "the hook is out of time," and other similar expressions which refer to the adjustment of a sewing hook. Your machine makes thousands of stitches per minute, and in order for it to work properly, the hook must be timed accurately to a thousandth of an inch. It must make its revolution and have its point above the eye in the needle as the needle makes its upward stroke after making a loop. The hook must also be set to the thousandth of an inch in its distance from the needle as it passes by picking up the loop.

The hook can be so far away as it passes that it will miss the loop, or it can be so close as to hit or graze the needle on its trip. For the most part, timing a machine hook is a job for the shop mechanic. Considerable damage can result if the timing job is done improperly.

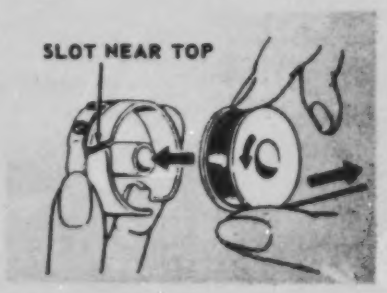
The chainstitch machine does not have a bobbin, but it has a looper which is threaded and serves as a bottom thread. The looper must perform like the sewing hook. The looper point must be at the needle at the right time to catch the loop. The main difference between a chainstitch and a lockstitch machine is that the lockstitch requires a bobbin for bottom thread supply, while the two-thread chainstitch (401) gets its supply from a thread cone.

When you want to change the bobbin, follow illustrated steps below:

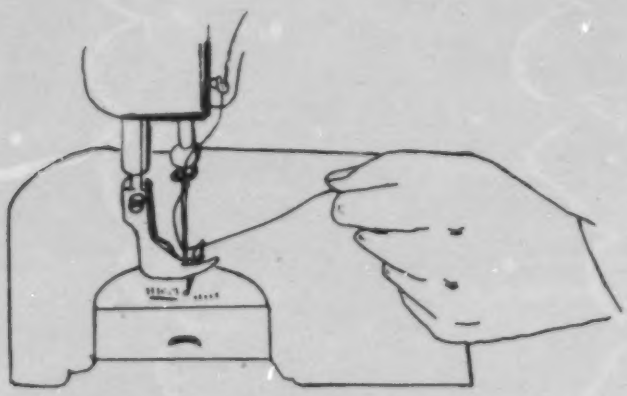




Place the full bobbin (from the winder) in the bobbin case. Pull the thread from the bobbin through the tension slot.



The bobbin case must be replaced over the center post in the hook and pressed in until it locks and until an audible "click" is heard. The latch should be closed when inserting the case to feel or hear the click.



Turn the hand wheel in the operating direction with your right palm while pulling the thread up from the bobbin, using your left hand.

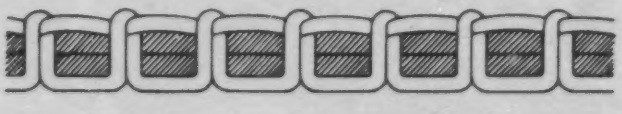
h. Thread Tension

Probably the greatest source of trouble to an operator is in stitch formation. Each machine is designed to make a stitch in a specified manner, and when it fails to do so, trouble sets in. Many things can go wrong with stitch formation, such as loose stitches and poor tension.

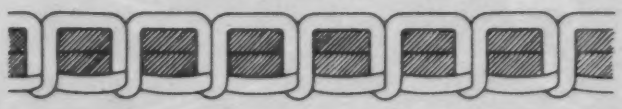
If you recognize loose stitches and poor tension as they appear, and if you are able to correct them, you will find that you are earning more than the operator who is always calling the Supervisor or the mechanic with an excuse such as, "My machine isn't sewing right, and I don't know what's wrong with it!"

Once the machine is threaded, we can see how many points the thread must touch before it will sew properly. All of these points, including the tension spring assembly, are designed to deliver the thread to the needle with a certain tautness and, by the action of the check spring and take-up lever, allow the thread to become loose enough to form our needle thread "loop." When the loop has formed and the hook point has passed through the loop, it carries the thread around to encase the bobbin thread. Then the take-up lever raises the needle thread in order to set the stitch. You will hear the word "tension" used in connection with adjusting the tension screw; keep in mind that tension covers the entire path of thread, from the spool to the finished stitch, and its "condition" all along that path. If your bottom or top thread catches anywhere along the path, the tension will be affected. A lockstitch machine having at least one top and one bottom thread joins these threads to form a joint or lock which should be in the center of the plies of material.

If the tension of the needle thread is too tight, or if the bobbin thread is too loose, the needle thread will lie on the surface, and you can see the bobbin thread poking its head up. In a good stitch you cannot see the bobbin thread on the top.



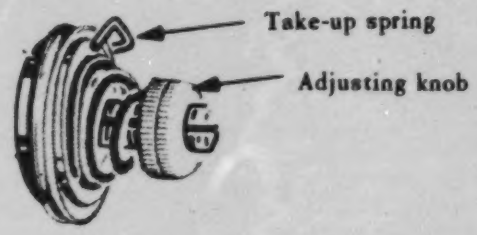
If the needle thread is too loose, or if the bobbin thread is too tight, you get the reverse effect of the bobbin thread lying on the surface of the underside, and the top thread will be visible between the stitches.

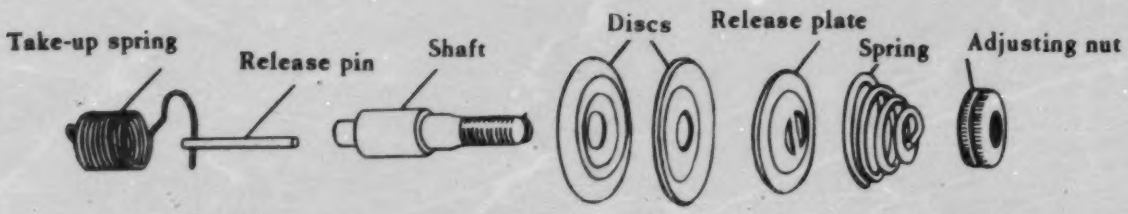


We know that a good lockstitch appears the same on both sides, and to produce this the tension must be correctly balanced.

We have discussed the tension and check spring assembly, but we have not yet discussed what it contains or how it is controlled.

Every machine must have a tension spring assembly, even though it is not always in the same position. You may find it on the side or on the back of the machine, but usually it is in the front within easy reach of the operator.





From the above, we can see that by turning the adjusting knob, we will tighten the spring's pressure on the plate and thus slow down the progress of the thread through the discs. Place a piece of thread between your forefinger and thumb, press lightly, and pull the thread through with your other hand. Now squeeze your fingers together and pull the thread some more. Note the difference in the pull of the thread. The discs under the tension spring serve as fingers in holding back on the thread.

Therefore, to tighten the tension or pull on the thread, tighten the adjusting knob by turning it to the right. To loosen the tension, turn to the left. Never turn the screw more than 1/4 turn at a time before testing, since the spring is very sensitive.

When adjusting tension with the adjusting knob, be sure the presser foot is in the "down" position, because when the foot is raised, it engages a pin that releases the pressure on the tension spring, and accurate pressure cannot be gauged. (If your knee is leaning on the kneelift, it can have enough pressure to release the spring.)

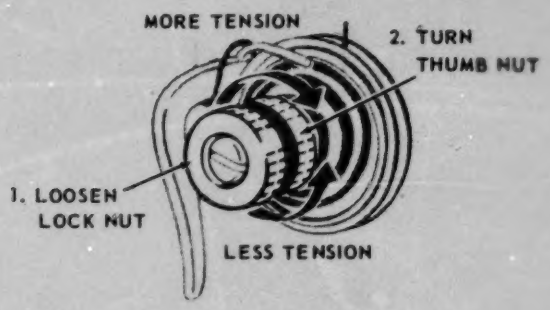
After adjusting the top tension, if you find that the stitch is not forming properly, check and adjust the tension control on the bobbin case.

There is a spring and adjustment screw on the bobbin case. Normally when this has been set for a certain thickness of thread, it does not have to be adjusted further. Test the "pull-off" of the bobbin thread, and if it is not correct, then adjust the screw in the same way as you did the tension screw. This must be done with a fine screwdriver. A turn to the right will tighten the tension; a turn to the left will loosen it. If you hold the end of the bobbin thread and let the bobbin hang free at the end of the thread, the thread should release a little at a time when you gently shake the thread.

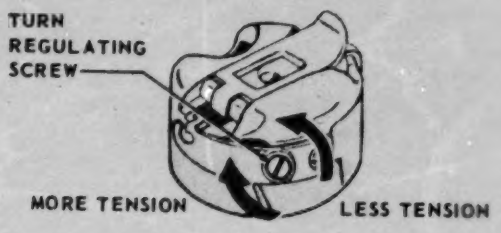
The tension on the machine is very important. If you want a perfect seam, the tension must be right. Many problems come from the wrong tension. If the top tension is too tight,

the thread breaks. If the top tension is too loose, the seam has loops on the bottom. If the top tension is correct, the seam is smooth and the same on both sides. A well-trained operator will recognize the need for the adjustment of the tension and will usually accomplish this adjustment without outside assistance.

Remember, to change the tension, turn the adjusting nut on the tension assembly. To make the tension tighter, turn to the right (clockwise). To make the tension looser, turn to the left (counter-clockwise).



Sometimes you must change the tension on the bobbin case. Turn the tension (large) screw on the bobbin case to adjust the tension. Turn to the right (clockwise) to make the tension tighter. Turn to the left (counterclockwise) to make the tension looser.



i. Thread Breakage

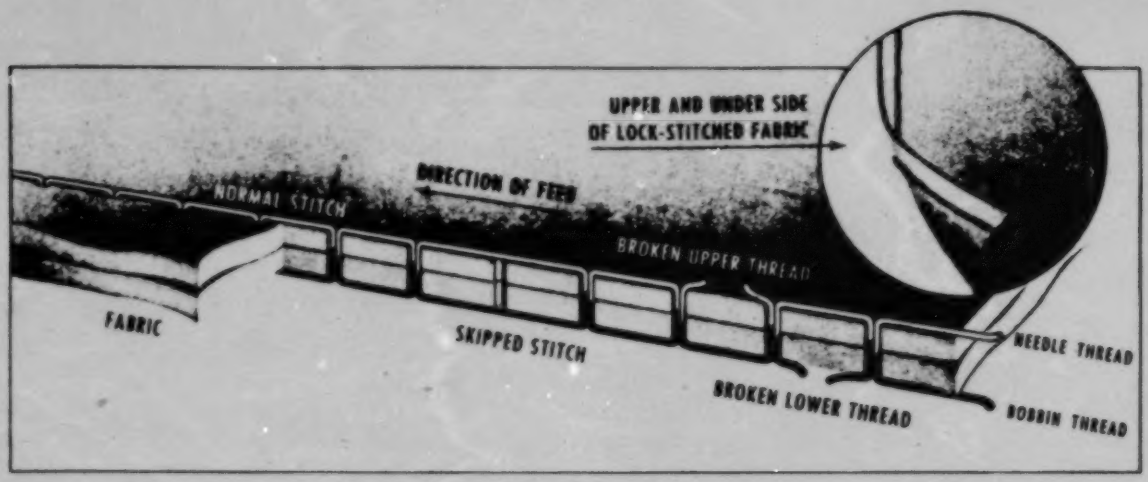
If your thread is old or dry, it may break through no fault of the machine. When you have continual thread breakage, check to see whether it is the fault of the thread before searching for other possible sources of the trouble.

The average sewing machine thread has good, tensile strength for sewing, but if you try to break it with your hands, you will find that it snaps very easily. The reason it snaps is that you have placed more strain on the thread than it was intended to carry.

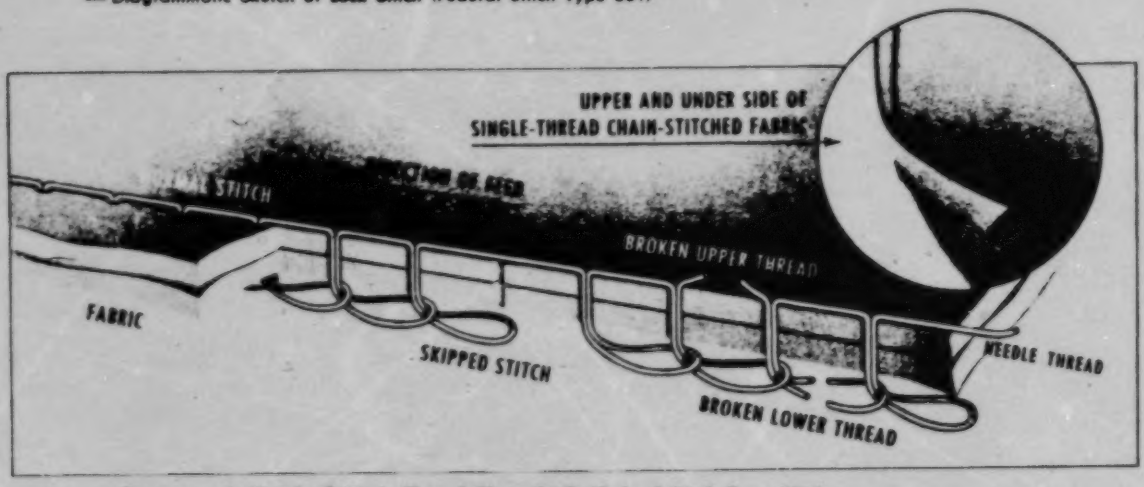
The thread can easily carry the strain placed on it by your machine, but if it is hindered or stopped in its normal path, it will definitely snap. The average operator will follow a regular sequence of check points to determine the cause of breakage. While it is not necessary to check them in any regular order, here are the points which should be checked:

(1) If the machine has recently been threaded, check the threading of the machine.

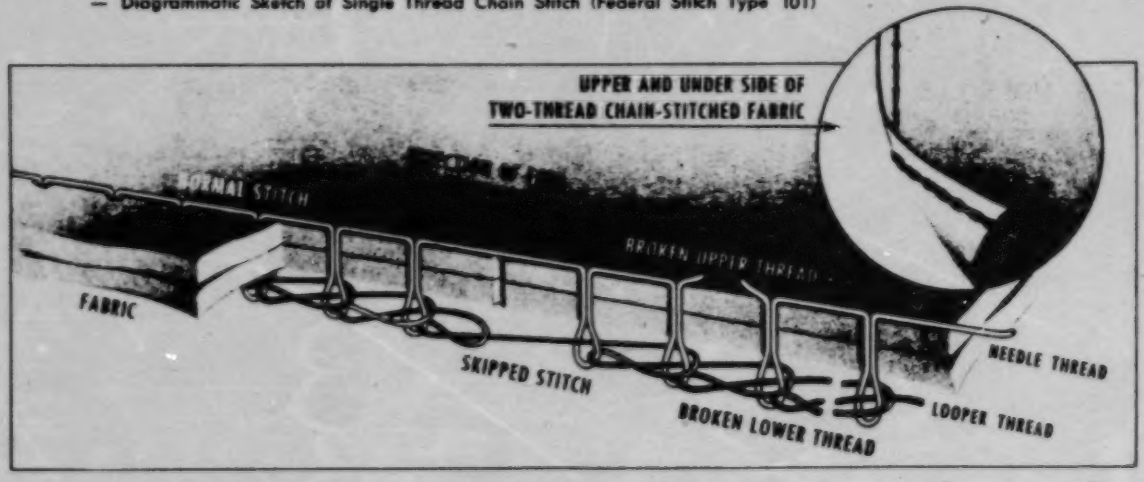
STITCH FORMATIONS AND FAULTS



— Diagrammatic Sketch of Lock Stitch (Federal Stitch Type 301)



— Diagrammatic Sketch of Single Thread Chain Stitch (Federal Stitch Type 101)



— Diagrammatic Sketch of Two Thread Chain Stitch (Federal Stitch Type 401)

Copyright ©1953, Singer Sewing Machine Co.

(2) Check the surface over which the thread passes by releasing the tension spring (with your knee or hand lever) and pulling the thread through the needle. Sometimes a bad spot will show up by snapping the thread in this maneuver.

(3) The needle itself can break thread if it has a rough eye, a burred point, or just gets "hot." Certain materials cause friction, which will heat a needle and cause it to break thread. If you are not able to find the trouble, it is a good idea to change the needle. Often a needle will look good, but because of microscopic faults which you cannot see, it will not sew.

(4) Check the presser foot for rough spots or cuts on the surfaces that the thread uses.

(5) Check the hole in the throat plate for grooves which can be made by the thread itself after much use. Thread can wear away any metal if enough of it passes over the same spot, or a rough edge has been knicked by the needle.

(6) Turn the motor off, thread the machine properly, turn the hand wheel by hand several times, hold both threads in your left hand, and pull from under the presser foot. When the machine is in this position, you can usually find anything impeding the thread underneath. A bad spot on the traverse or the sewing hook can impede the thread. An improperly inserted bobbin case can also impede the thread.

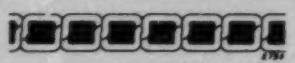
(7) The sewing hook may be at fault. If it is out of time, it will not engage the loop properly. If the point is blunted, it will snap the loop rather than engage it. If it is set too close or too far from the needle, it will start skipping stitches, and this quickly leads to broken stitches.

When you have checked all of these areas, and the machine is still breaking thread, the cause is likely to be in a place which you will not normally be able to detect. If your machine is not feeding properly and does not "sound" right, you had better call for assistance.

If you could take a census of all the sewing machines in the world, you would find that most of them are lockstitch machines. The first machine ever made on a mass production basis by Isaac Singer was the lockstitch machine.

The outstanding characteristic of the lockstitch machine is that it has at least two threads, one top and one bottom, and the stitching appears the same on both sides of the seam.

A lockstitch will not ravel out, and it is less elastic than the chainstitch. Look at some of the clothes you are wearing and see if you can pick out the seams made on a lockstitch or chainstitch machine.



UNIT III

MACHINE OPERATION

Adjustment of Chair Height, Treadle and Kneelift

You can develop the skills necessary to make a good operator. The instructor can only guide and advise you.

There is only one way to develop a skill: practice, practice, and still more practice. The same rule applies for learning to play the piano, to play tennis, or to type. Your instructor can guide you into good work habits and teach you some "tricks of the trade," but you have to practice in order to learn these skills.

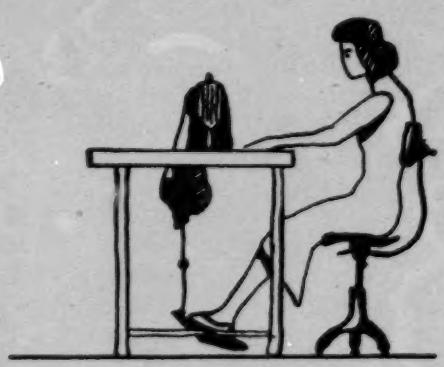
The purpose of this course is to aid you in developing skills that you will need to work as an industrial sewing machine operator. When you are working in industry, every day you will get the practice you need.

All machines are not alike, and all operators' chairs are not alike. The chair which you will use may differ from machine to machine and from company to company.

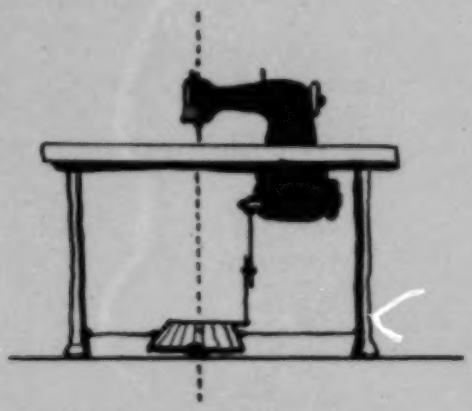
Before you can attempt to become an operator, you must be comfortable and have good posture at your work area. If you are not comfortable, you will tire easily, and your production rate will be low. Good posture and comfort are very important.

If your chair is the adjustable type, take the time to adjust the leg height, the back, and the back rest. (A few minutes can save you from an aching back.) You may be required to change machines from time to time; if you do change, be sure the new chair fits you. If your chair is not the adjustable type and is not comfortable, ask for another one. Your instructor will realize the importance of your being comfortable at the machine.

The next item that should be adjusted is the foot treadle, which controls the speed of the machine. Make sure that your machine is unthreaded and that your hands are away from the needle; then turn on the switch of your machine. Place both feet on the treadle. Raise the presser foot slightly, using the kneelift. The presser foot is raised slightly if you are going to sew without material, in order to prevent unnecessary wear on the feed dog. Now you are ready to check your treadle. Push down with your toes until the machine starts to sew. Press back with your heels to stop the machine. If you are not comfortable using the treadle, adjust it so that it will be comfortable for you. Check the angle at which the treadle is set. Check the "play" in the treadle rod. The treadle rod should be tight enough to allow rapid starting and stopping. You should sew with both feet on the treadle. Ask the mechanic in the plant to assist you in correcting the treadle height.



Check the position of the treadle in relation to the head of the machine. A treadle is considered to be in line with the head when the needle of the machine is directly over the center of the treadle. See drawing below:



The last comfort point to check is the kneelift. You may not find a kneelift on every machine (some special machines have a floor pedal to raise the presser foot), but you will probably do most of your sewing on machines that are equipped with the kneelifts.

To check the kneelift, you should be seated comfortably after adjusting your chair and treadle. You will press your knee in a sideways motion against the kneelift to lift the presser foot. Therefore, the kneelift should fit your leg in such a way that when you press it, the position or pressure of your foot on the treadle is not affected.

Loosen the adjusting screws or bolts and set the kneelift plate at a comfortable height and distance from your knee. It is usually better to have the instructor or another operator do this for you, so that you can sit in a normal position while it is being adjusted. Once the kneelift has been adjusted, try it to make sure it is comfortable.

Control of Machine Speed and Kneelift

No matter how much you know about a sewing machine, you can never become a successful operator until you can control the speed of your machine and make it perform as you wish it to perform. Good control means that you can sew as fast or as slow as you choose; that you can start and stop the machine when you want to;that you can feed your materials evenly; and above all, that you can use the machine to the full capacity for which it was built. If your machine was built to sew 4000 stitches per minute,and you can't control it when it gets over 2000 stitches per minute, you are not getting full efficiency from the machine.

To learn control, it is not necessary to use either cloth or thread, since we are primarily concerned with your ability to make the machine sew fast or slow at your command and to start and stop when you want it to. Anyone could supposedly sew by jamming his foot down on the treadle. The machine would run, but without control.

To practice control, therefore, we will start by leaving the machine unthreaded and use paper instead of cloth. This will give you something to feed, and the needle will leave holes in the paper to indicate where the seam would be if the machine were threaded. (The paper used should be just heavy enough so the needle and feed do not tear it.)

NEVER RUN YOUR MACHINE IF THE FOOT IS DOWN UNLESS THERE IS SOMETHING BEING FED INTO THE MACHINE. The feed dog hitting the presser foot will ruin the teeth of the feed and the under surface of the presser foot. It will also break your thread.

Turn the switch on and make sure that your feet are either on the floor or in a "braking" position. Raise the presser foot by pressing against the kneelift enough so that you can insert the paper "material" under the foot. When you release the pressure on the kneelift, your material should be tightly grabbed by the foot and the feed. NEVER TRY TO INSERT MATERIAL UNLESS THE NEEDLE IS AT THE TOP OF ITS STROKE.

You are now ready to try to treadle and find out how much pressure is required to start the machine, and how to increase pressure evenly to speed up the machine. Place a piece of paper under the presser foot. You will be feeding the paper and guiding it in a straight line at the same time. Stop the machine when you are about one inch from the end of the paper so as not to injure the feed, as mentioned previously.

With slight pressure on the kneelift, you can release the paper and turn it around so that you can start again. YOU CANNOT RELEASE ANY MATERIAL IF THE NEEDLE IS PENETRATING THE MATERIAL WHEN THE MACHINE IS STOPPED. Be sure the take-up lever is also in the highest position. (This is a good sewing habit to acquire when you are sewing normally with cloth and thread.) In this position and with a slight raising of the presser foot, you can pull the work out with the threads attached, and the threads will not break. In this position all tension is off the thread, and it can be pulled through the eye of the needle.

Continue to "sew" on the paper, using the rules you have learned, until you feel that you are getting some control of the machine. About this time you will start using printed paper practice sheets. Remember to practice.

One more good habit that should be begun at this point is the proper positioning of your fingers and hands in the feeding motion. In normal sewing operations, your left hand is usually occupied with the bulk of the garment and is mainly concerned with moving that bulk in the general direction, and at the same speed as the machine is sewing. The left hand normally lies lightly on the material to the left of the presser foot with palm down and uses only slight fingertip pressure. Your right hand controls the material as it goes toward the needle. Since the material must be kept taut in its movement to the needle, the position of the fingers of your right hand becomes very important and the basis for another good sewing habit. The right hand maintains a slight tension by pulling back gently to maintain alignment and control of the edges.

In picking up, handling and disposing of work we depend to a great extent on "kinesthetic" or "muscle" sense. This can be demonstrated by closing your eyes and touching the tip of your nose with your finger. This "kinesthetic" sense lets us know automatically where parts of our bodies are located. A good operator soon learns to utilize this "kinesthetic" sense, as well as her peripheral or side vision.

UNIT IV

BASIC MACHINE CONTROL

Instructions

Now you are ready to practice and develop individual machine operation skills. The teacher will demonstrate each exercise before you begin to practice on it. These exercises are designed to help build the speed and control that is necessary to become a good operator. Your ability to coordinate eye, hand-finger, and foot movements will determine how successful you will be as an operator. The amount of your weekly earnings on the job will depend on how well you develop these skills and at what speed you can control them.

The next page is a record sheet that will help you visualize your progress on each of these paper exercises and for other exercises that follow. You will time each skill and practice until you can reach the target as given in the instruction on each paper sewing exercise. As you work on your targets, post the time of each trial on the record sheet. When you hit or beat the target for one exercise, ask the instructor to review your work and check your results. If the instructor approves your work, you will begin the next exercise.

A supply of the paper exercise sheets and record sheets should be printed for the course. The paper used for the exercise sheets should be just heavy enough so the needle and feed do not tear it.

Assignment

1. Practice on the following 8 paper exercises until you can hit your target on each exercise. (The machine is not to be threaded.)

2. Record the number of times you practice on the record sheet provided. If you have not hit your target by the 20th attempt, continue to practice, and record these on another record sheet; number it Page 2.

3. Sew as fast as you can but maintain quality as you control the machine.

4. When you feel that you have reasonable control of your machine, ask your instructor to check your time and quality.

EXERCISE RECORD SHEET

Trial No.	Paper Sewing Exercises								Motion Economy Exercises		Sewing Exercises				
	1	2	3	4	5	6	7	8	1	2	1	2	3	4	5
1															
2															
3															
4															
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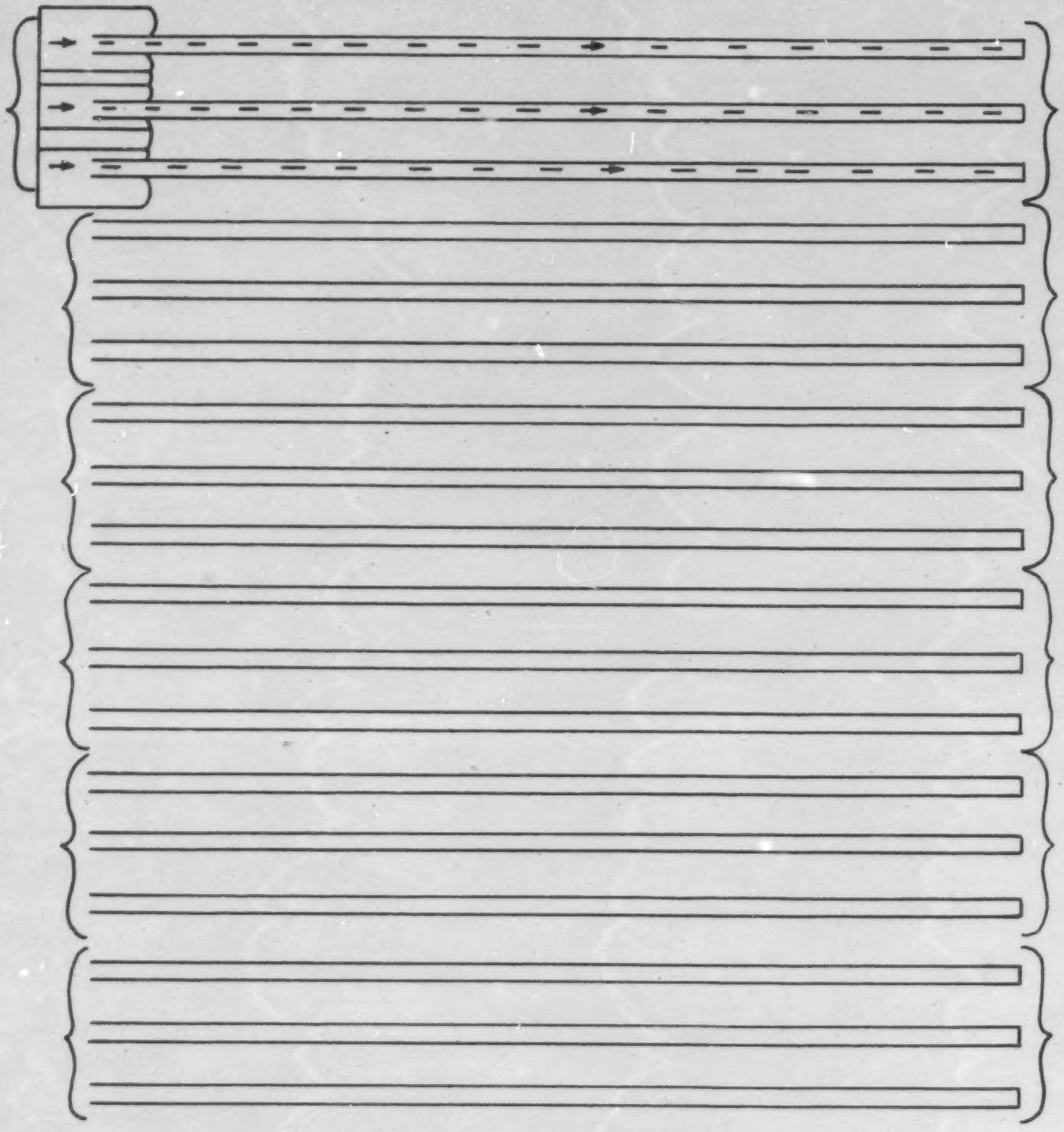
Name_____ Date_____

EXERCISE 1

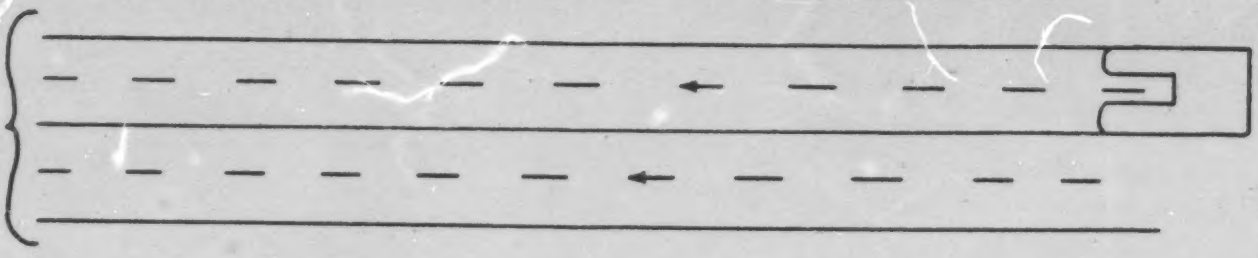
After the instructor demonstrates Exercise 1, you will stitch in each channel without touching either side, and you will stop sewing at the end of each channel. Start at the same end of the channel each time. (Demonstrate handwheeling, posture, pedal control, and hand feeding of paper charts with a light touch.) Target Time: 15 seconds for 3 lines.



Name_____ Date_____

EXERCISE 2

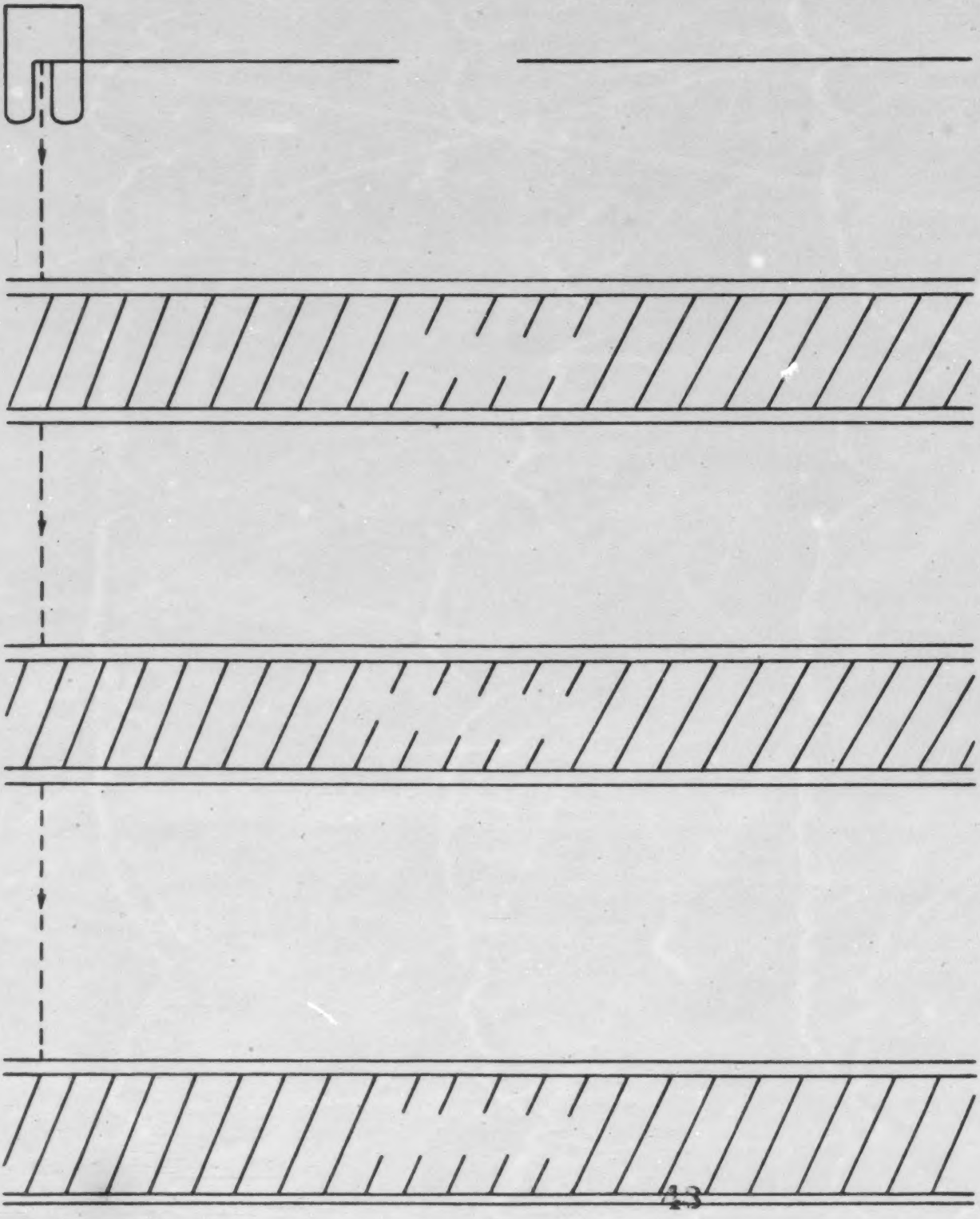
After the instructor demonstrates Exercise 2, you will stitch two straight lines, using the side of the foot as a guide. Stop at the end of each line. Target Time: 6 seconds for 2 lines.



Name_____ Date_____

EXERCISE 3

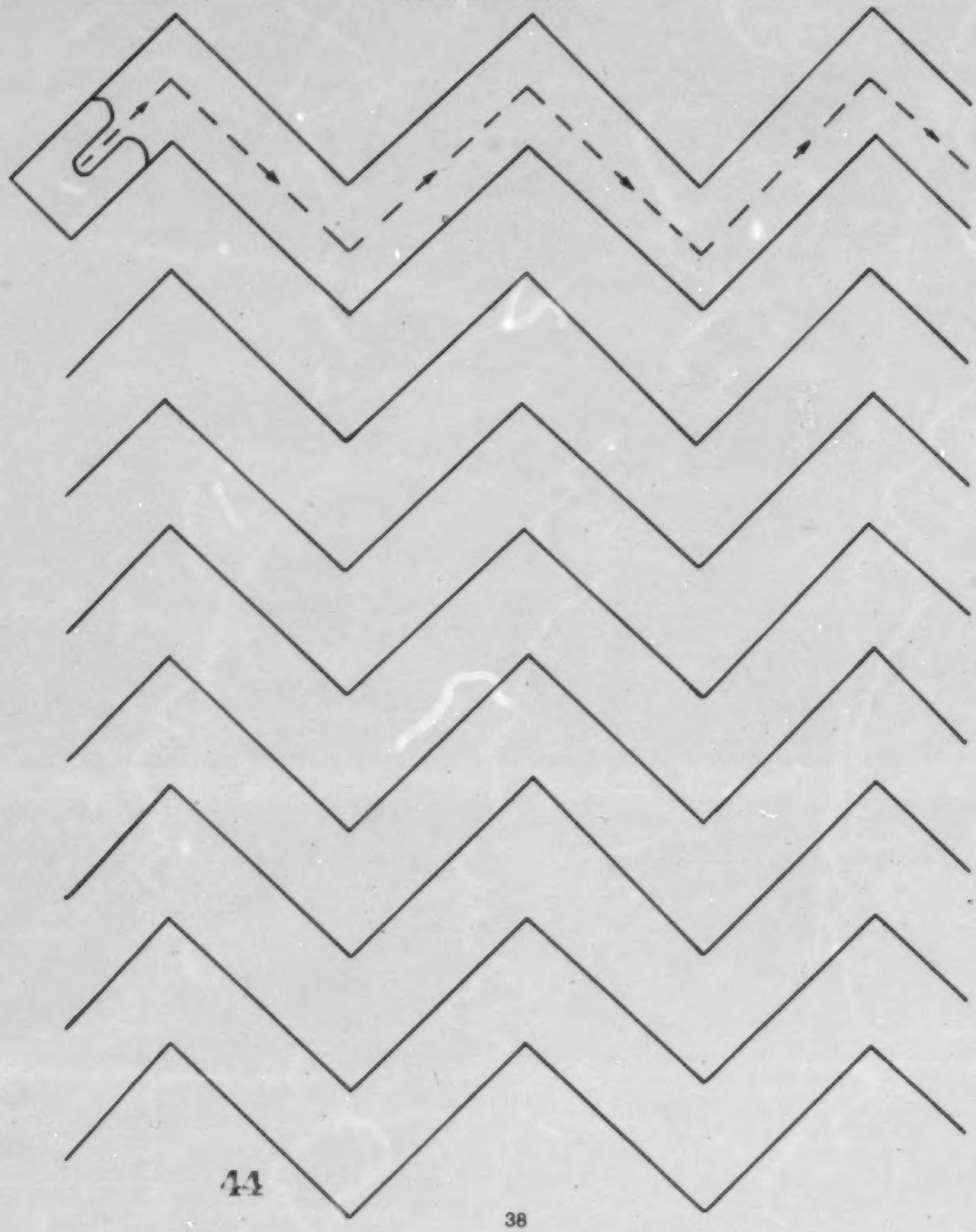
After the instructor demonstrates Exercise 3, you will stitch straight lines within the three open spaces; skip over the diagonal-lined areas. Target Time: 10 seconds for 3 lines.



Name _____ Date _____

EXERCISE 4

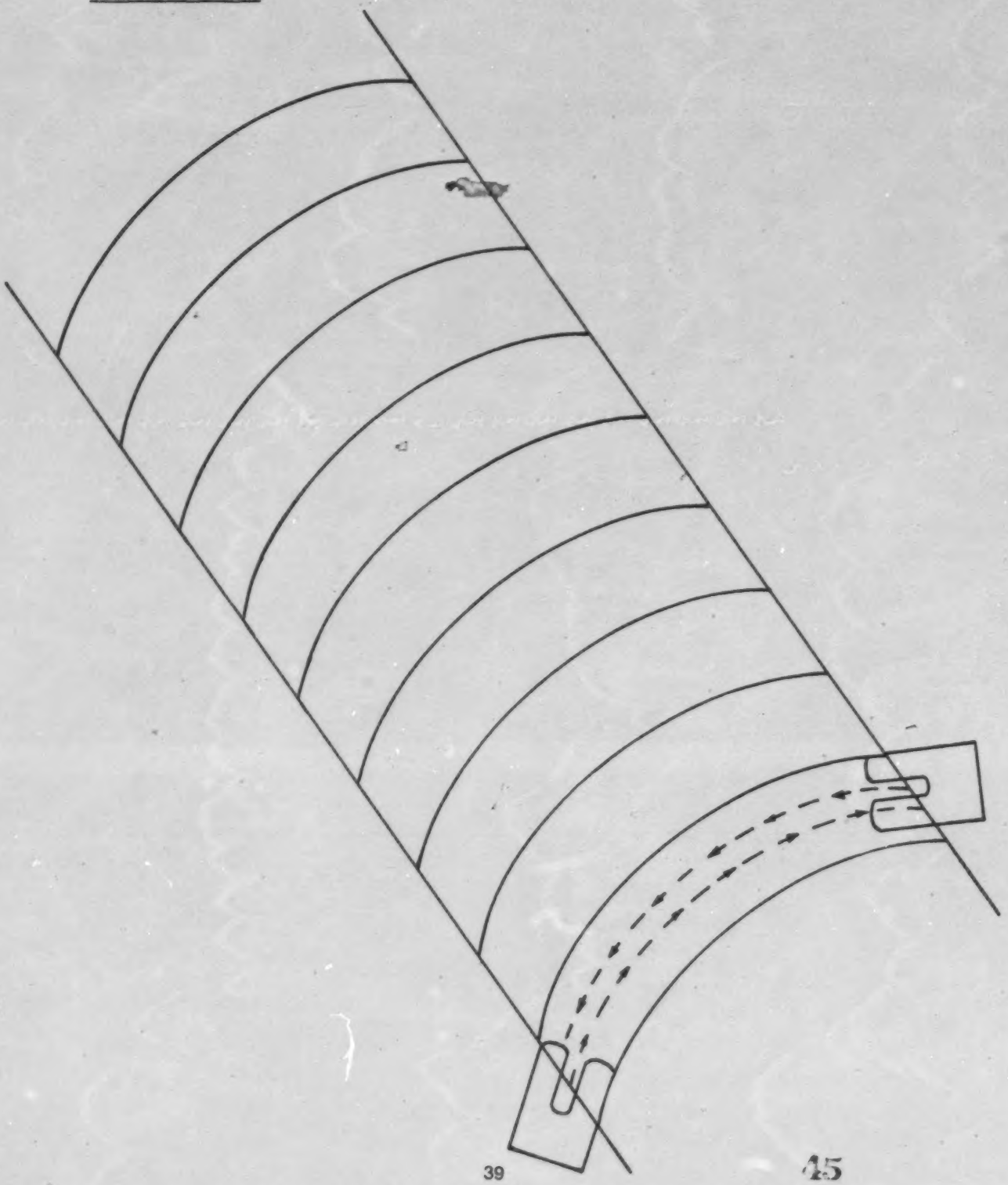
After the instructor demonstrates Exercise 4, you will stitch a zig-zag line beside the printed line, using the side of the foot as a guide. (Stop with the needle down and turn at each point in the zig-zag line.) Target time: 20 seconds for 1 line.



Name_____ Date _____

EXERCISE 5

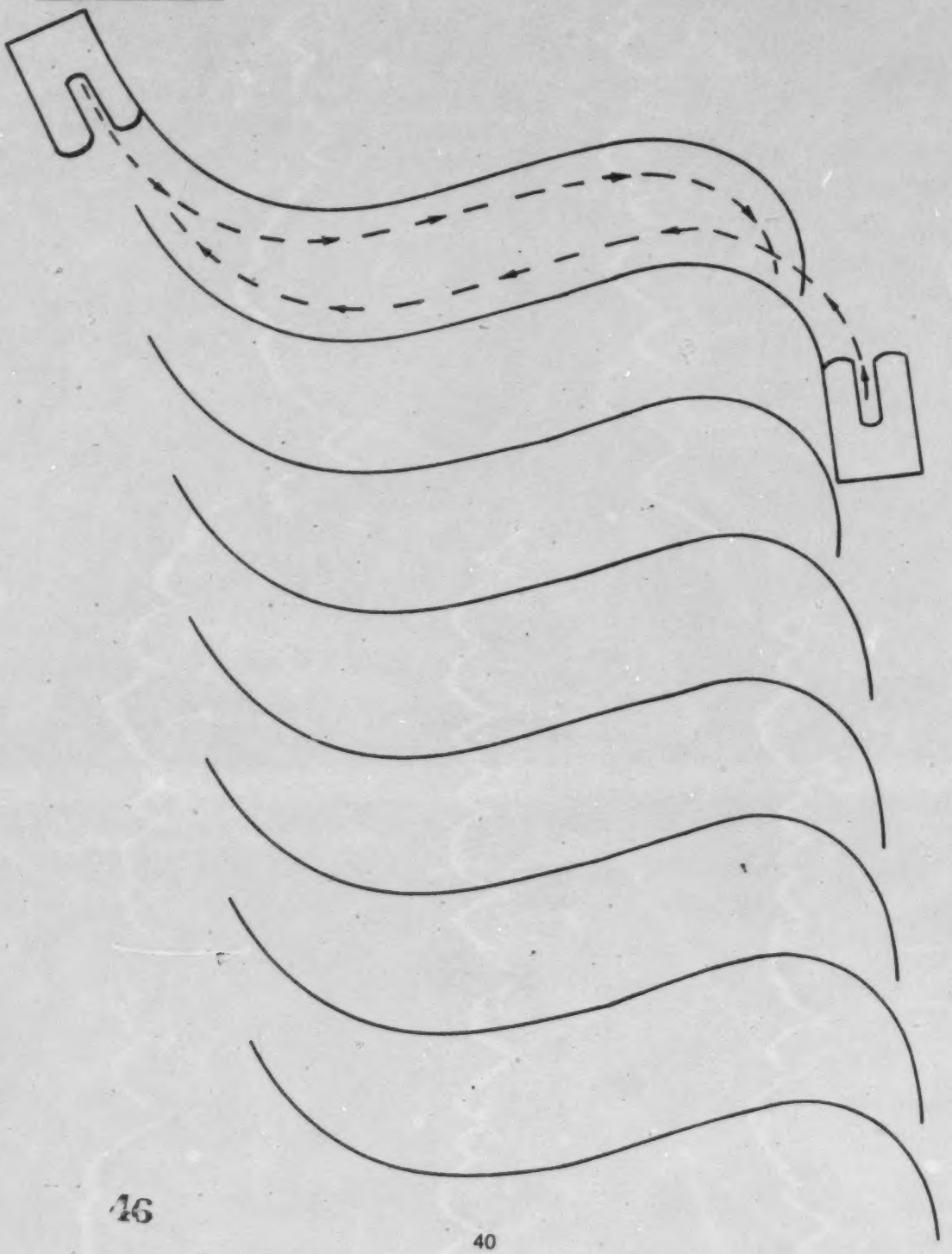
After the instructor demonstrates Exercise 5, you will stitch two curves between one pair of printed curved lines, using a side of the foot as a guide. (Start one at each end.) Target Time: 6 seconds for 2 lines.



Name_____ Date_____

EXERCISE 6

After the instructor demonstrates Exercise 6, you will stitch two S's between the drawn S-shaped lines, using the side of the foot as a guide. (Start one at each end.) Target Time: 11 seconds for 2 lines.



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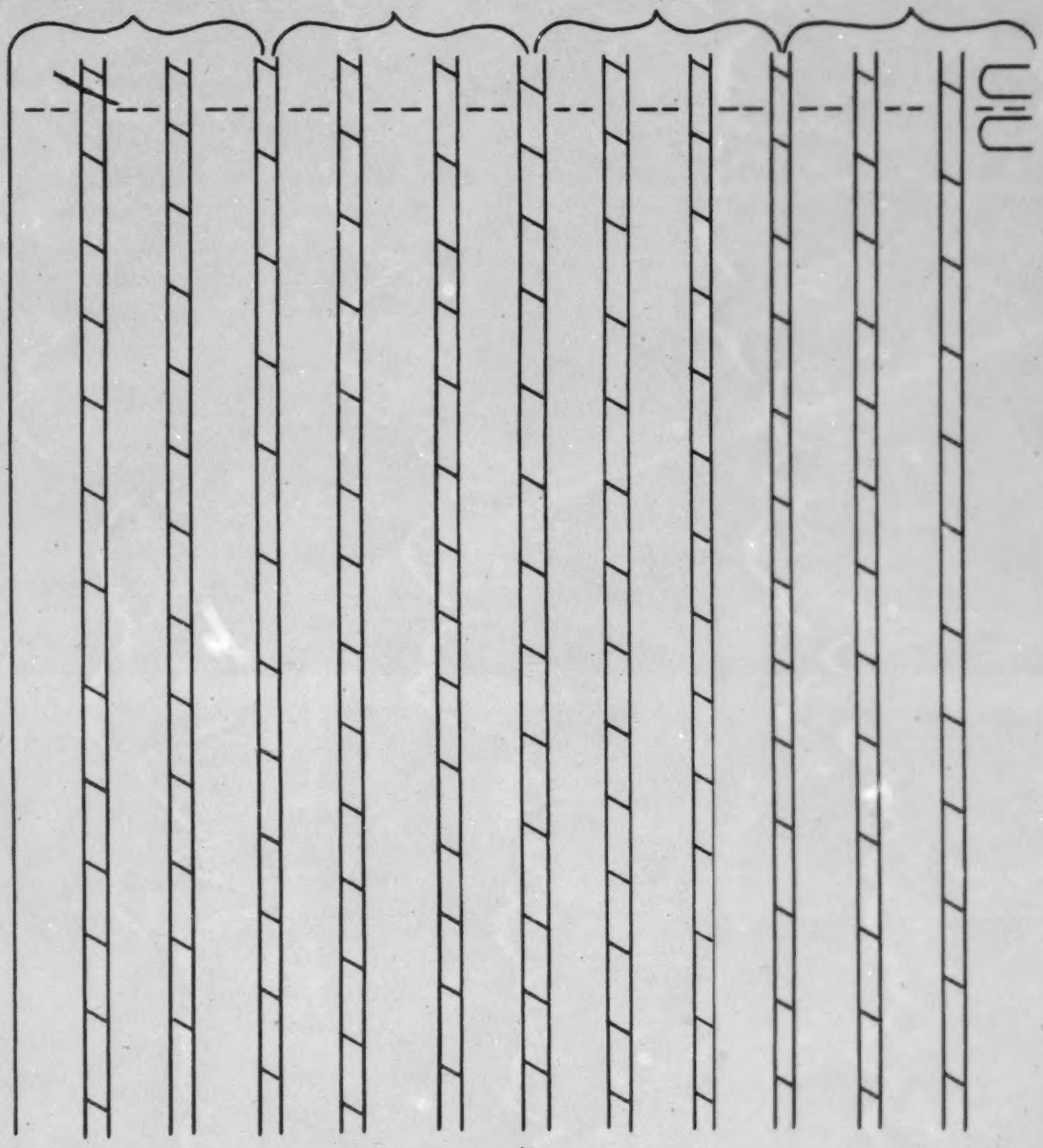
Name_____ Date_____

EXERCISE 7

After the instructor demonstrates Exercise 7, you will stitch three short rows of two or three stitches each, within the diagonal lines. Target Time: 6 seconds for 3 runs.



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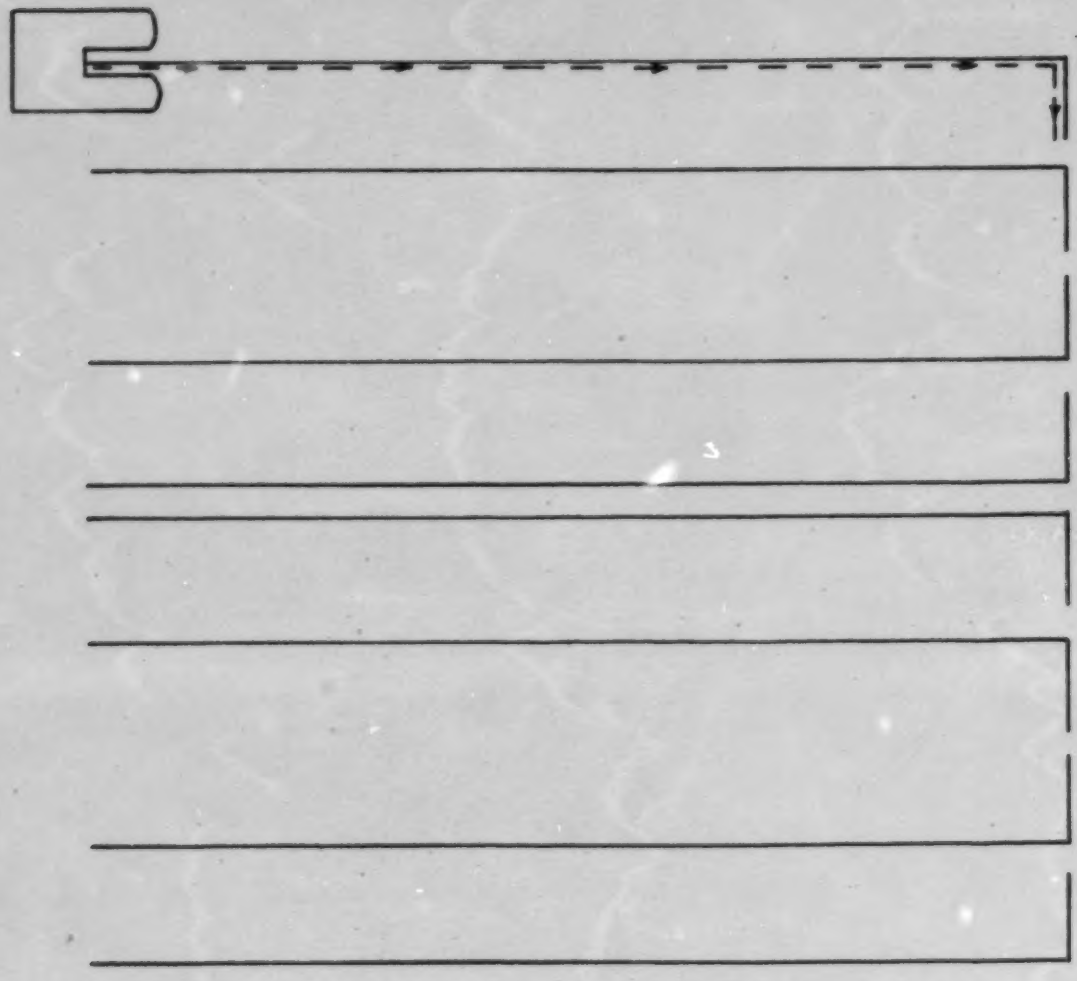
Name_____ Date_____

EXERCISE 8

After the instructor demonstrates Exercise 8, you will stitch at top speed to junction of cross lines. Stop with needle down, make turn, stitch 4 to 6 stitches and stop. (Some right turns and some left) Target Time: 7 seconds for 1 line.



UNIT V

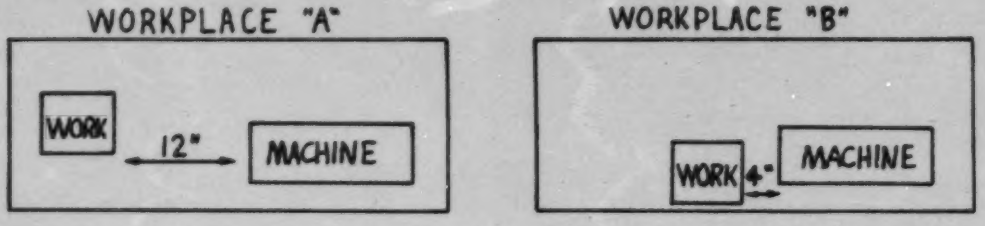
MOTION ECONOMY

Motion Economy Principles

One objective of this program is to create an awareness of the importance of using economy of motions. Students should develop an understanding of the importance of developing good motion paths while they are learning sewing skills.

What is motion economy? Motion economy is the use of time-saving techniques; it means working smarter, not harder. By utilizing these motion economy techniques, an operator can earn more money easily.

Example:



The above example shows that Workplace "B" saves the operator time by reducing the distance her hand must travel to pick up her work. Some of the basic principles that have application to sewing operators are:

a. Use Simultaneous Pick-up and Disposal

Both hands can be performing separate tasks during some parts of an operation. The pick-up of one piece should be accomplished during the disposal of the completed piece. The disposal should be forwarded or moved to the left by the left hand, while the right hand picks up from the right side.

b. Use Simultaneous Pick-ups

An operation involving pick-up and assembly of two pieces should have the pick-ups accomplished simultaneously. Usually this will mean that the left hand disposes, while the right hand reaches to and grasps one of the next pieces. The left hand should then move to the other piece and grasp it. Then both hands pick up, position, and align to the needle. The right hand should not pick up and deliver the pieces until the left hand is ready to deliver its piece.

c. Position Work to Reduce Movements

When two pieces are to be picked up at one, time can be saved if the piece to go underneath is located on the right and the piece to go on top is located on the left. This normally will eliminate a regrasp.

d. Eliminate Regrasps

Anytime operators pick up a piece with either hand, they should grasp it at the point at which it will be assembled. This will prevent moving the hand again in a regrasp. Even if

the pick-up seems a little awkward at first, it can be learned. Also, pay attention to whether the thumb is on top or bottom during the grasp, pick-up, and delivery. If the operator later has to turn the hand over to do the job, then time can be saved by grasping the other way.

e. Grasp with Thumb Down on Right Hand for Long Runs

When grasping to sew on long runs, the right hand should have fingers on top, thumb underneath. This allows sewing all the way in to the point of grasp without a stop. If you grasp with the thumb on top, you will have to stop when your hand reaches the tabletop to reposition. (This refers to runs of about 15 inches or more.)

f. Keep the Right Hand Busy

In sewing, when the right hand must release as the work moves to the needle, the right hand should not be idle while the left hand guides through and disposes. The right hand should immediately move to its next function.

g. Perform Handling While Sewing When Possible

Whenever possible, another part of a job should be accomplished during the sewing element. Sometimes it is possible to accomplish the pick-up or disposal while sewing. This, of course, saves valuable time.

h. Sew with Fewest Possible Stops

Always notice the number of stops you are using, and be sure you are sewing to the maximum possible length. Many operators tend to sew short, jerky seams. Listen to the machine; it should develop maximum speed in smooth, long runs. The right hand grasp often determines the length of sewing between stops.

i. Accomplish Work During Positioning if Possible

Do everything you can during the positioning of your work. Sometimes an operator can fold a corner or turn a seam back during the pick-up and position time so that she does not have to do this work after the material reaches the needle. Again, this is using both hands wisely.

j. Hold Body Movements to a Minimum

Pre-position work so that all handling elements are accomplished with the minimum amount of body movement. For example, if only the arm from the elbow down needs to be moved, do not move the upper arm. Avoid twisting or turning the body. This will reduce fatigue and eliminate extra movements, thus saving time.

k. Pick-up and Disposal on Same Side

If both hands must be used to accomplish a disposal, usually the pick-up and disposal should both be located on the left side. This keeps body movement to a minimum and allows the operator to focus her eyes on both hands and work.

l. Use Both Feet

Machine control is easier if both feet are used on the treadle. This will also reduce fatigue, because the body is in the most natural position for sewing.

m. Use the Machine Speed

Run the machine as fast as possible. Many trainees develop a fear of the speed of the machine and lose progress by their concentration on holding the machine speed down. The faster you can sew and keep your machine under control, the more productive you will be.

n. Use the Brakes

Use the machine treadle brakes. An operator must learn to set her heels firmly on the back of the treadle to make sharp, quick stops instead of coasting to a stop.

Motion Economy Exercises

This series of exercises is designed to stress the importance of handling the work efficiently and quickly. The trainee should be made to realize that on most sewing operations, 30-80 percent of the time is spent handling the work, as opposed to actual sewing. Through these exercises the trainee can practice some of the basic principles of motion economy and learn the importance of developing a good motion path for any sewing operation. The instructor is encouraged to design additional exercise to demonstrate the motion economy principles outlined in this section. Turn the machine off during these exercises.

Use these exercises as the student is ready; allow one student to time another student when feasible. It is recommended that cut pieces of fabric approximately 3x8 inches be used for the following exercises. The instructor may feel the need to vary the target time slightly due to varying conditions that modify the exercises, such as the use of different fabrics.

a. Motion Economy Exercise #1 (Refer back to Principle "a," Use Simultaneous Pick-up and Disposal)

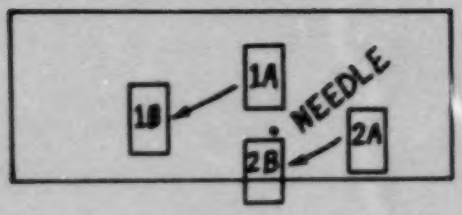
(1) Purpose

To demonstrate that by using both hands simultaneously, the time to perform an element of the job can be reduced. Suggested techniques: You may want the operator to be timed on a few cycles of this element without using simultaneous motions before you let her begin using the simultaneous motions. By comparing the before and after time, the operator will begin to appreciate early the purpose of motion economy and will also feel a part of her new accomplishment.

(2) Handling One Component

When handling one component, the operator should always attempt to accomplish a simultaneous pick-up and disposal.

The exercise should begin by placing the first piece up to the left side of the presser foot. Both hands should be at the needle. Upon signal the operator should, with the left hand, pull the work away from the needle and dispose to her left on a rough stack on the machine table. At the same time the right hand reaches to the right, grasps the next piece, and delivers it to the left side of the presser foot. This is repeated for 20 pieces.



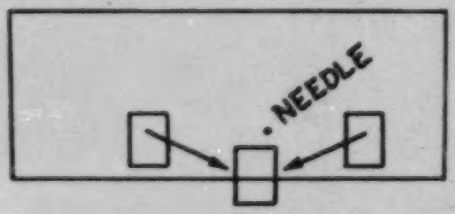
The total elapsed time is computed. The standard time for this exercise is 35 seconds for 20 pieces.

b. Motion Economy Exercise #2 (Refer to Principle "b," Use Simultaneous Pick-up)

(1) Assembling Two Pieces

When an operator is doing an operation which involves picking up two components for assembly, she should always use simultaneous motions.

This exercise starts by positioning a stack of 10 components at each side of the operator. Upon signal she reaches to each stack simultaneously, picks up and moves the top ply from each stack to a point in front of her, aligns the edges, left piece over right, and positions them in front of the needle.



The total elapsed time for assembling the 20 components is computed. The standard time for this exercise is 38 seconds.

(2) Note

To most effectively pick up and align two pieces, the piece to go on bottom should always be picked up by the right hand to avoid regrasps. The instructor should demonstrate this to the trainee.

Achievement of 100 percent performance consistently on these exercises constitutes another important accomplishment in the program. The student or instructor should record times on an Exercise Record Sheet as previously provided. This will indicate student progress to the student and the instructor.

Motion Economy and the Job Cycle

When you work as a sewing machine operator in an apparel manufacturing plant, you will be doing production work using some of these motion economy principles.

You may, however, be specializing on one part of a garment. For example, your job may be to hem cuffs, attach sleeves, or hem bottoms. If you hem cuffs, every cuff that you hem is "one unit" or "one cycle." If you attach collars, every collar that you attach is "one unit" or "one cycle." If you hem bottoms, every bottom that you hem is "one unit" or "one cycle."

In other words, whatever your job may be, every job that you do is "one unit" or "one cycle." This specialization lends itself to better efficiency and higher earnings under the piecework pay system.

When you do your job, you must use the proper method. In the plant your supervisor or a trainer will explain and demonstrate the proper method, and she will work with you until you learn to do it. Learning the basic skills in this course will make learning your job in the plant much easier.

UNIT VI

BASIC INDUSTRIAL SEWING OPERATIONS

Introduction

Up to this point the student has learned to maintain and control the industrial machine basically without thread and without sewing an actual seam on fabric. In this section students will sew various cloth exercises. Quality and speed will be measured, and cloth exercises will be repeated until the final exercise is mastered at a speed and quality level simulating an actual operation in an apparel plant.

Quality of workmanship is one, if not the most important, aspect of industrial sewing. During the course of study devoted to specific sewing training, quality will be emphasized over and over again along with the importance of performing at a productive level.

An introduction to the importance of quality should certainly stress the fact that poor work results in a loss to the individual operator. This is true because in most plants defective work must be repaired by the operator on her own time, thus causing her earnings to suffer.

Poor quality in most cases also causes lost sales—a plant agrees to provide its customers with garments that are at a certain quality level. After this agreement is reached, it is the responsibility of the plant to deliver high quality garments.

To clearly understand the responsibility of a garment plant and a sewing machine operator in serving customers, we will study a simulated situation. We are committed to shipping goods of a certain quality level to a customer. What happens when we find, through inspection, garments that fail to meet the quality specs?

a. If they cannot be repaired, they are turned into seconds, and the company loses the difference between the sale price of a first quality garment and that of a second. In other words, the garments are usually sold at a loss.

b. If they can be repaired, time must be spent in ripping, repairing, resewing, repressing, refolding and reinspecting. Repairs cause work to be processed two or more times. This is all extra cost.

Quality control in the apparel industry ranges from rather simple, 100% in-line inspection procedures to full statistical quality control programs. Quality is the responsibility of every operator.

As the student embarks upon this section, the single, most important factor enabling her to acquire these skills will be her attitude toward learning them. It should be pointed out that a high degree of concentration will be required, since these motions and the coordination needed will be new to her. As more skill is gained, these drills and exercises will become easier. An interesting exercise may be used here to point out these facts.

Name-Writing Exercises

Students will prepare to participate in two or more name-writing exercises. Paper and pencil are required to participate in these timed performance, writing skill exercises.

a. When the teacher says "go!" the students will write their full names as fast as they can.

Learning Experiences: When the students have finished writing their names, the teacher will discuss with them the following questions:

(1) Approximately how many times have you written your name in your life?
(2) Were you relaxed while you were writing your name? Why?
(3) Did you have to concentrate to write your name?
(4) Is your writing easy to read? How can you improve?
(5) Do you spell most words correctly? How can you improve?

b. This exercise will be similar to the first, except that only 1/2 as much work is required. When the teacher says "go!" the students will write their full names as fast as they can, but they will leave out every other letter in their names.

Learning Experiences: When the students have finished writing their names and leaving out every other letter, the teacher will discuss with them the following questions:

(1) Do you like to write your name and leave out every other letter? Why or why not?
(2) Did this writing require you to concentrate? Why?
(3) Were you relaxed as you wrote your name? Why?
(4) Did you write your name faster or slower when you left out every other letter? (You had only half as many letters to write.)
(5) Was your writing easier or harder to read than usual?
(6) Were you proud of the way you wrote your name when you left out every other letter?

The remainder of this section will involve sewing exercises, and the student should maintain a positive attitude towards learning them, by practice and repetition.

An initial period of time will be required for the student to review and practice skills in threading the machine and operating it prior to the exercises. These skills were studied in Unit II, The Industrial Sewing Machine. These skills are necessary before speed and quality can be achieved. Some of these skills are:

a. Proper threading of the machine
b. Method for changing and filling bobbins
c. Positioning of needle and take-up arm when removing or inserting work under the foot
d. Adjustment of thread tensions and the ability to recognize a bad stitch

Cloth Exercises

In order to develop basic sewing machine skills, a series of five preparation drills must be learned. These are: maintaining seam tolerances, utilizing full machine speed, performing simultaneous motions, performing backstays, and performing pivots.

The first five drills are for the purpose of preparing the student to perform specific skills with accuracy and speed. This high quality skill development is necessary to perform the graduation drill. These drills are not "busy work." They are designed to help the student become a successful graduate. Drills and targets may need to be modified for certain fabrics. They were designed on a fairly stable broadcloth.

a. Cloth Drill #1—Plain Seaming—Target Time: 36 seconds (.60 minute) (5 repetitions)

Cloth Drill #1 is simply picking up two pieces and sewing them together with a plain seam, while developing certain fundamental skills. The teacher will instruct the students to place the 8" x 4" material stacks to the left and right as close to the needle on the work station top as possible, without hindering either the actual sewing or the students' body movements during the drill.

Motion Path: The LEFT HAND reaches and grasps a single piece of material from the left stack of material. At the same time the RIGHT HAND reaches and grasps a single piece from the right stack. The grasps for both the LEFT and RIGHT HANDS should be performed at the upper right-hand corners with thumbs on top.

Next, match and align the corner edges±1/16" by bringing the two pieces together. The LEFT HAND should continue to hold the two pieces together near the upper right-hand corner, while the RIGHT HAND slides down the long (8") edges along the right side to align the edges.

During the pickup, match and align the pieces of material. The presser foot of the machine should be raised so that the leading edge of the material can be placed under the presser foot without waiting for the foot to be raised. Once the two matched pieces are under the foot and against the needle, the foot should be lowered to secure the pieces. A seam margin of 3/8"± 1/16" is desired. The 3/8" margin must be determined prior to sewing, and a "sight" gauge, such as a piece of tape 3/8" to the right of the needle on the throat plate, is very helpful.

The LEFT HAND is now lying lightly on the material to the left of the foot, with the palm down and with slight fingertip pressure. The RIGHT HAND is grasping the two pieces of material at the bottom right-hand edge, with the fingers on top. The RIGHT HAND is maintaining a slight tension by pulling back gently to maintain alignment and control of the edges.

When sewing, the LEFT HAND will follow the material past the foot, towards the rear of the machine. The RIGHT HAND will likewise follow the material up to the foot and release the material during the final one inch of sewing. The LEFT HAND guides and controls the material, while the RIGHT HAND maintains edge alignment and follows the material to the needle.

Upon completion of sewing, the machine should continue to run, allowing the material to run out completely from under the foot. As the material clears the foot, the LEFT HAND should reach back to the trailing edge, grasp the material, and pull the thread chain back and over the spring knife or cutter at the back of the foot, thus cutting the chain. This should be a smooth, sweeping motion. (The instructor will demonstrate the correct way to cut a thread chain.)

After the thread chain is cut, the LEFT HAND should move the material and dispose it to the disposal stack. As the LEFT HAND disposal is being performed, the RIGHT HAND should begin reaching for the next piece in the right pickup stack.

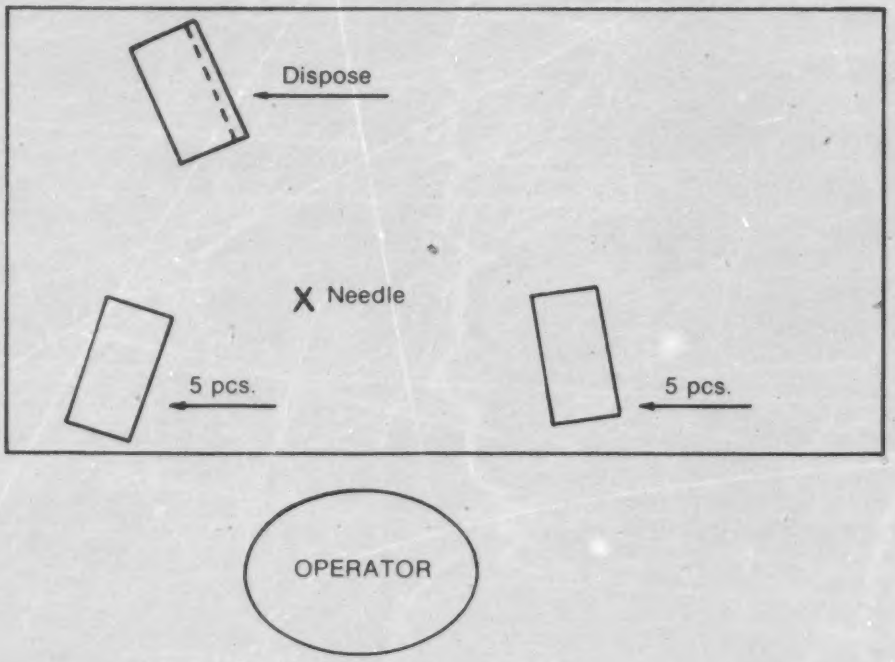
Learning Experiences: The instructor will demonstrate proper work arrangement, stressing the importance of keeping work as close to the needle as possible. Demonstrate the proper method by "walking through" the drill and explaining key points, such as:

(1) Simultaneous pickup with LEFT and RIGHT HANDS
(2) Raised foot during other motions
(3) Proper edge tolerance (±1/16")

CLOTH DRILL #1
(Simple seam—two pieces)

TARGET TIME: 5 REPETITIONS - 36 seconds (.60 min.)

WORK PLACE



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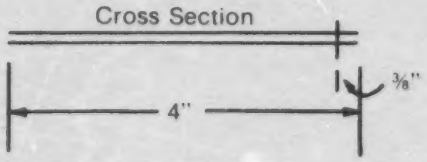

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(4) Sighting proper seam tolerance (3/8" ± 1/16")
(5) Proper position of hands
(6) Sewing at full speed with quality
(7) Smooth, continuous motions
(8) Establishing sense of rhythm

After the demonstration, let the students practice the drill while the instructor circulates among them, giving individual instruction and encouragement. When the instructor feels that the students as a group are ready to perform against the target time, proceed with the timed drills.

b. Cloth Drill #2—Topstitching—Target Time: 27 seconds (.45 minute) (5 repetitions)

Cloth Drill #2 uses the sewn work from Drill #1. This drill requires improvement of sewing skill and quality through topstitching and closer seam tolerance.

Work Arrangement: The instructor will ask the students to place a reasonably neat stack (10-15 pieces) of work completed in Drill #1 to the right of the needle on the machine tabletop. This stresses the importance of good work arrangement. The pickup stack of work should be placed to the student's right, with the seam completed in Drill #1 closest to the operator (seam on the left side with raw edges to the right).

Motion Path: As the LEFT HAND is cutting the thread chain and disposing to the left and rear of the previously sewn work, the RIGHT HAND reaches to the right to the pickup stack for the next piece. The RIGHT HAND grasps the top ply's right edge approximately in the middle, with the thumb on top and fingers underneath, so as to separate the top and bottom plies of the piece.

Since the RIGHT HAND has control of the top ply, the RIGHT HAND should begin to move the material to the left, so that the work is "opened up" (much like turning the page of a book) and spread flat on the work station top. The raw edges of the seam completed in Drill #1 should be underneath the material on the left side of the fold.

The LEFT HAND reaches to the material on the left side of the fold and holds the material lightly with the fingertips, palm downward. The RIGHT HAND has released the pickup grasp and reaches to the top of the fold. The index finger of the RIGHT HAND, starting at the top, moves down the entire length of the fold seam, exerting enough pressure to insure a smooth, flat fold. While the RIGHT HAND is smoothing the fold, the LEFT HAND gently pulls the material to the left.

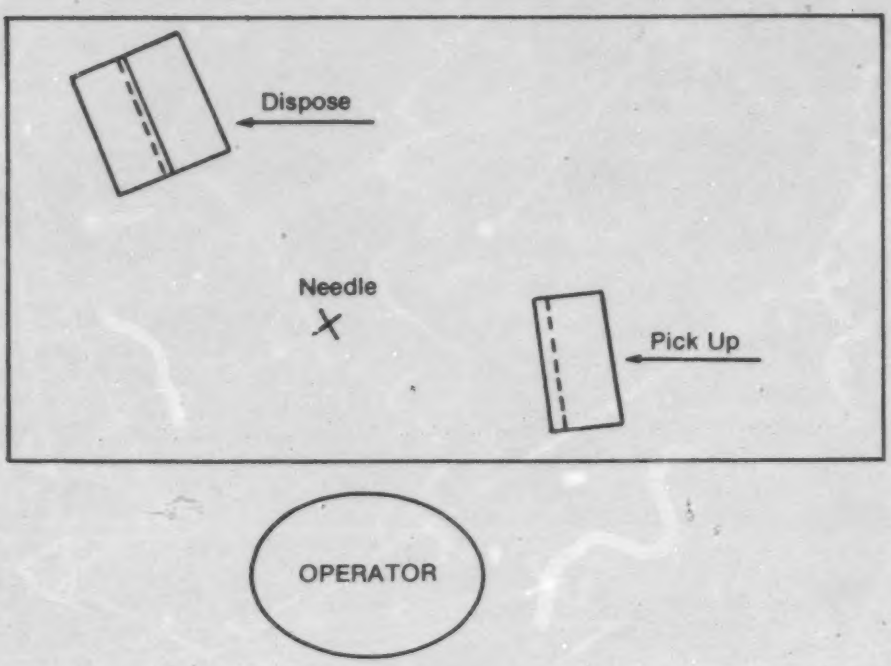
Upon completion of the fold, the RIGHT HAND stops at the bottom of the fold with fingers and thumb on top of the right of the fold. During the "smoothing" element, the presser foot should be raised. The work is positioned by using RIGHT and LEFT HANDS together, sliding the work to the needle, aligning for a 1/16" seam, and lowering the foot.

Maintain a 1/16" seam margin and sew the entire length of the folder seam without stopping. Again, while sewing, the LEFT HAND will control and guide the work, while the RIGHT HAND follows. NOTE: Both hands should exert a gentle pull outward-LEFT to left side, and the RIGHT should gently pull to the right side. Upon completion of sewing, the LEFT HAND performs the cut thread chain and disposal, while the RIGHT HAND releases and begins to reach for the next pickup.

CLOTH DRILL #2
(Topstitch seams)

TARGET TIME: 5 REPETITIONS - 27 seconds (.45 min.)

WORK PLACE



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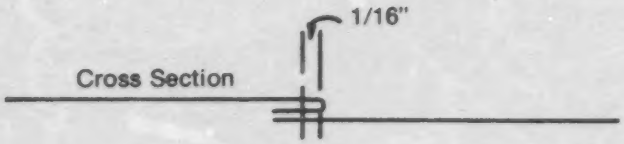


c. Cloth Drill #3—Simple Fold—Target Time: 42 seconds (.70 minute) (5 repetitions)

Cloth Drill #3 allows the student to become familiar with a simple turn-under and stitch operation. This drill also calls for a certain degree of finger dexterity and control in performing the single fold-under and matching edges without the assistance of a folder. Drill #3 uses the sewn work from Drill #2.

Work Arrangement: The instructor will ask the students to place a reasonably neat stack (10-15 pieces) of work completed in Drill #2 to the right of the needle on the machine tabletop. The work should be lying with the exposed raw edges from the previous Drills #1 and #2 visible. Proper work arrangement, of course, is a must!

Motion Path: As the LEFT HAND cuts the thread chain and disposes to the rear and left, the RIGHT HAND reaches and grasps the next piece from the pickup stack. The grasp is performed at the upper left-hand corner of the stack. After the grasp, the RIGHT HAND begins to move the next piece towards the needle. During this move, the RIGHT HAND should begin "rolling" over the edge of the material.

The LEFT HAND, in the meantime, has completed the disposal and reaches toward the RIGHT HAND to assist in the completion of the fold-over of the leading edge started by the RIGHT HAND. When the work is placed on the work tabletop in front of the needle, the RIGHT HAND releases and slides along the folding edge, allowing the LEFT HAND to complete the 3/8" fold at the upper left corner of the leading edge with the thumb on the bottom. As the RIGHT HAND slides down the leading edge, with the thumb inside the fold, the fingers on top of the material should be folding approximately 3/8" over until the RIGHT HAND reaches to the bottom corner of the leading edge. Then the RIGHT HAND folds the corner, aligns to the 3/8" fold-over, and grasps tightly.

Simultaneously the LEFT and RIGHT HANDS, while firmly grasping the folded over corners, move the folded over leading edge toward the right raw edge and match and align folded edge to right edge ±1/16". The LEFT HAND then carefully removes the left index finger from between the folded under edge and raw edge and moves it under the raw edge while the left thumb maintains firm pressure, and the left index finger and thumb grasp near the corner.

The RIGHT HAND continues to firmly grasp the folded edge and raw edge, properly aligned, at the bottom corner. With both hands in the above position, slide the work under the presser foot and lower the presser foot. Maintaining full control of turn-under with the RIGHT HAND while the LEFT HAND guides the work by and behind the presser foot, sew the entire length (8") and perform thread cut and disposal as previously described in Drill #1.

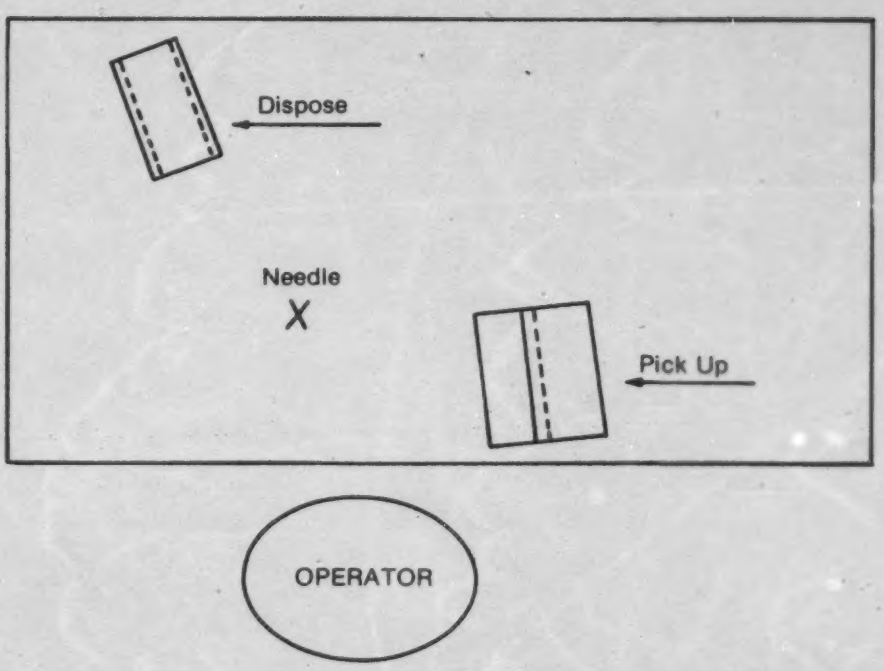
Learning Experiences: The instructor will discuss with students the importance of the following statements:

(1) Ability to start folding while moving a piece of work is important.
(2) Correct pickup points are time-savers.
(3) Seemingly difficult finger dexterity is only a matter of practice.
(4) Preparation folding may be accomplished while moving and/or sliding fingers along edge to be folded.

CLOTH DRILL #3
(Turn over and stitch)

TARGET TIME: 5 REPETITIONS - 42 seconds (.70 min.)

WORK PLACE



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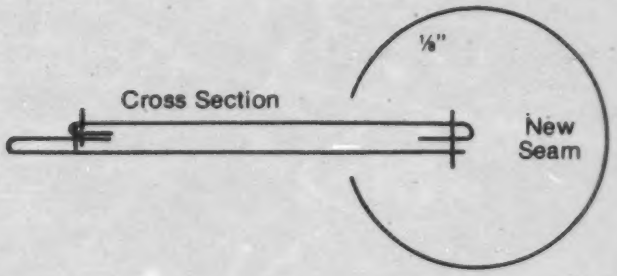

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d. Cloth Drill #4—Backstay Drill—Target Time: 30 seconds (.50 minute) (1 repetition, 5 seams)

Using the completed work from Drill #3, the Backstay Drill is designed to develop skill for backstaying (back tack) and stop/start control of the machine.

Work Arrangement: Place a reasonably neat stack (10-15 pieces) of work completed in Drill #3 to the student's right on the work station. The 8" edge should be approximately at a 45° angle to the edge of the work station top nearest the operator, with the simple fold seam (Drill #3) facing to the rear of the work station.

Motion Path: As the LEFT HAND disposes the completed work to the left and rear, the RIGHT HAND reaches to the next piece on the pickup stack. With fingers on top and the thumb hook-up underneath, the RIGHT HAND grasps the work in approximately the middle of the seam edge completed in Drill #2.

The RIGHT HAND moves the work to the sew line on the work station top in front of the needle. (The presser foot should be raised.) The LEFT HAND reaches to and grasps the left side of the work, with fingers on top. The RIGHT HAND disengages the thumb from underneath, while aligning the work to the needle such that the right edge of the work is approximately 1" to the right of the sew line, and the 8" side is parallel to the edge of the work station top nearest the operator.

Both hands position the work under the presser foot by sliding the work up to the needle. Lower the presser foot. The hands are now in the normal sew position: LEFT HAND fingers and thumb resting gently on top of material beside and to the left of the foot; RIGHT HAND fingers resting gently on top of material to right and rear of work.

Using both hands, sew in a straight line to the edge of the finished fold (do not sew onto the fold—stitches should end 1 or 2 stitches before the fold)—and backstay nearly 3 to 4 stitches. Backstaying (back tacking) may be accomplished in the following manner: Slow down (but do not stop) the machine speed toward the end of the stitching requiring a backstay. Slightly raise the presser foot to release pressure. Use the fingertips of both hands and firmly, but gently pull the work back toward you. (The direction of the pull is the direct opposite of normal machine feeding, i. e., toward the operator.) Backstay 3 to 4 neat stitches, placing them in the line of the original stitching, if possible, but at least parallel to the original stitching and as close as possible.

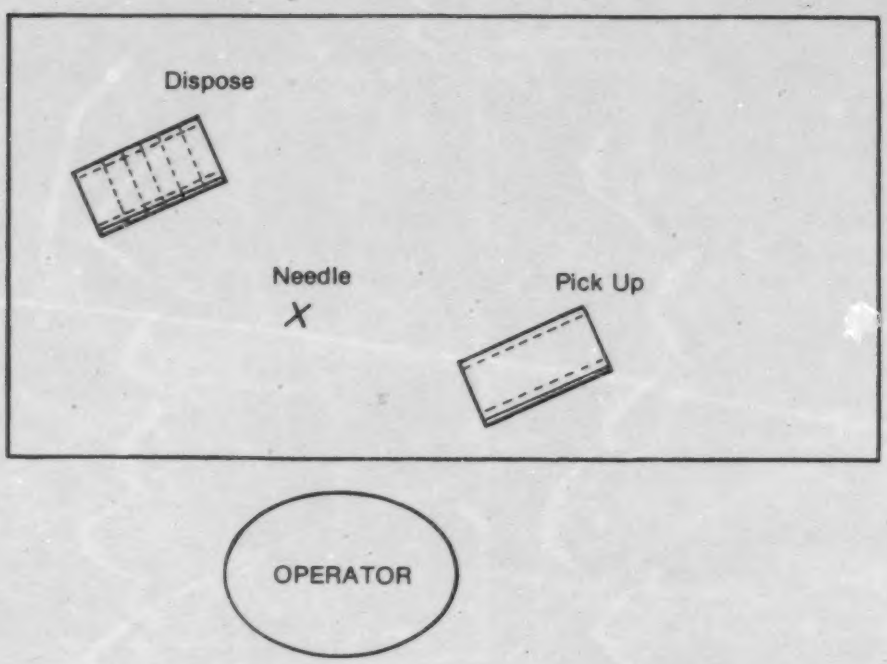
After backstaying, the LEFT HAND should continue to hold the material, while the RIGHT HAND reaches for the handwheel to position the needle in the "up" position. Be careful to palm the handwheel and keep fingers away from the belt. Then the RIGHT HAND reaches and grasps scissors or snips. During the handwheel turn the presser foot should be raised. The LEFT HAND slides the material out from under the foot enough so that the thread chain may be cut by the scissors or snips in the RIGHT HAND.

The RIGHT HAND then returns the scissors to the proper place, while the LEFT HAND repositions the work for the second backstay. After the scissors have been released, the RIGHT HAND assists the LEFT HAND in repositioning the work to the needle for the second backstay. The second backstay stitching should begin approximately an inch (1") to the left of the first backstay stitching. Repeat the backstay stitching as described four times, each time starting approximately an inch (1") to the left of the last backstay. After the last backstay, the LEFT HAND will dispose completed work to the left and rear, while the RIGHT HAND reaches for and grasps the next piece to be sewn.

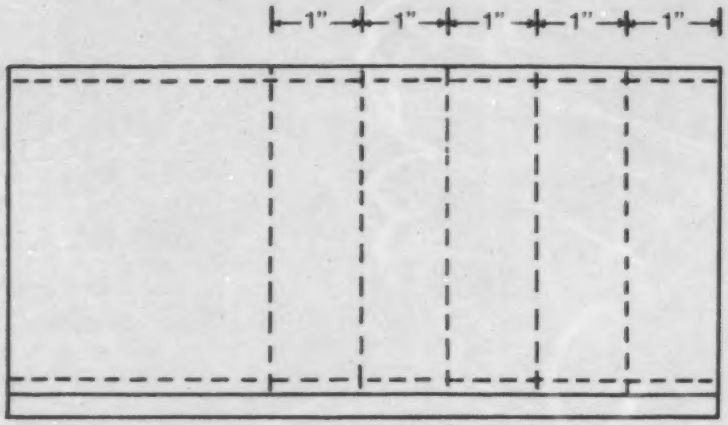
CLOTH DRILL #4
(Backstay)

TARGET TIME: 1 REPETITION (5 SEAMS) - 30 seconds (.50 min.)

WORK PLACE



SEAM



5 seams across pieces sewn in drill #3, with backstays even with seams sewn in Drill #2.

Learning Experiences: After an explanation by the instructor of proper work arrangement, the emphasis of Drill #4 is obviously on the backstay, with the accompanying stop/start control of the machine. The students will be allowed to practice backstaying on scrap before using completed work from previous drills. This will allow the student to get the "feel" of pulling back against the normal feed of the machine, as well as the releasing of pressure by slightly raising the foot. Key positions to be discussed/illustrated by the instructor while walking through the drill are:

(1) Continuous movements during the backstay
(2) No machine stops
(3) Stopping at a point
(4) Neat trimming of thread chain
(5) Handwheel control so that needle and take-up are in proper position to release the thread tension
(6) Releasing presser foot tension without breaking thread or losing feed of machine

e. Cloth Drill #5—Pivot Drill—Target Time: 30 seconds (.50 minute) (5 repetitions)

The last preparation drill features pivot control, as well as continued emphasis on stop/start control. The completed work from Drill #4 is used for this drill.

Work Arrangement: The instructor will place a reasonably neat stack (10-15 pieces) of work completed in Drill #4 to the student's right on the work station. The 8" edge should be approximately at a 30° angle to the sew line, with the edge fold seam to the right and the topstitch work to the left.

Motion Path: As the LEFT HAND disposes the completed work to the left and rear, the RIGHT HAND reaches to the next piece on the pickup stack; with fingers on top and the thumb hooking underneath, grasp the work approximately in the middle of the topstitch seam edge.

The RIGHT HAND moves the work to the sew line near the right-hand edge on the work station top in front of the needle. (The presser foot should be raised.) The LEFT HAND reaches toward and grasps the left side of the work with the fingers on the bottom and the thumb on top. The RIGHT HAND disengages the thumb from underneath and brings the thumb to the top, while fingers remain on top to rear and right of work. Together both hands align the work to the needle so that the stitch line is approximately 3/8" from turn-under fold edge, and the 8" side parallel to the sew line.

Both hands position the work by sliding the work to the needle and under the presser foot. Lower the presser foot. The hands are now in the normal sew position.

Using both hands, sew in a straight line, maintaining a uniform 3/8" margin with the 8" edge. After sewing approximately 7", begin to slow down the machine speed in anticipation of a stop, approximately 1/4" from the end of the piece.

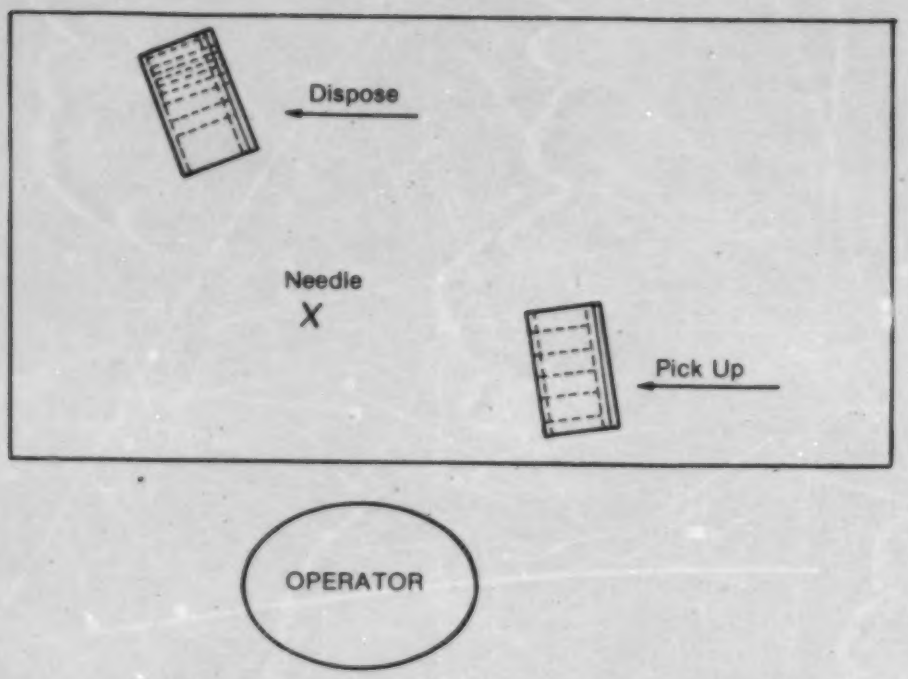
Stop with the needle down 1/4" from the end of the piece. If the needle has stopped in the "up" position, the RIGHT HAND should reach to and rotate the machine's handwheel counterclockwise (toward the student) until the needle is in the "down" position.

Raise the presser foot enough to allow the work to move freely. The LEFT HAND (still in normal sew position) should rotate the work in a counterclockwise movement 90°. This rotation can be accomplished by the LEFT HAND without regrasping the work; only a sliding

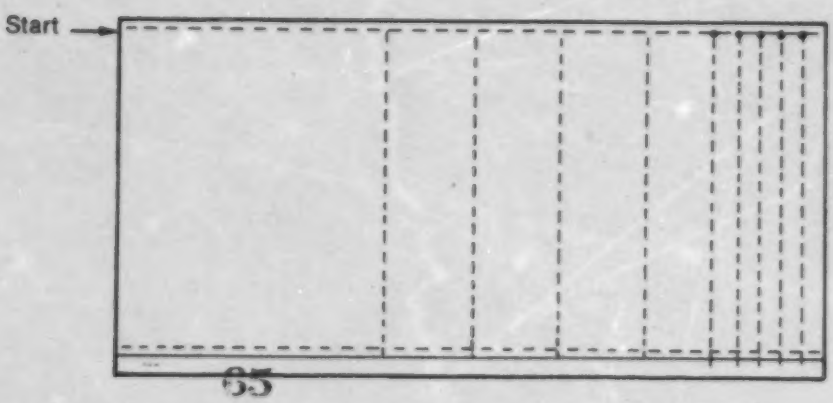
CLOTH DRILL #5
(Pivot)

TARGET TIME: 5 REPETITIONS - 30 seconds (.50 min.)

WORK PLACE



SEAM



Using pieces from drill #4, sew from start to ¼" from end pivot with needle down, and sew across work and off. Repeat 5 times, stopping and pivoting ¼" short of previous seam.

movement toward the student is needed, letting the needle act as the pivot. The presser foot is lowered. With both hands in the normal sewing position, sew in a straight line to and off the topstitch fold edge. Continue to sew until work clears from under the foot and stop when enough thread chain is available to cut. The LEFT HAND then performs the normal thread cut on the spring knife.

After the LEFT HAND has cut the thread chain, the LEFT HAND moves the work from behind the presser foot by sliding the work to the left. Use the fingertips and slide the work back around the presser foot toward the student for positioning to the sew line. As the LEFT HAND is moving the work, the work should be rotated 180° so that the pivot stitch seam edge is to the right on the sew line. The RIGHT HAND assists the LEFT HAND during this repositioning. After the repositioning is accomplished, both hands should be in the normal sew position. The presser foot should be raised.

Align the work to the needle and under the presser foot by sliding the work with both hands. The work should be aligned so that the stitching will be along the same line (±1/16") as the original pivot stitching.

Sew along the first pivot line of stitching until reaching approximately 1/4" from the first pivot point. Again stop, rotate the work 90°, and sew off. Repeat the same stitching three (3) additional times, each time pivoting approximately 1/4" from the last pivot.

Learning Experiences: The instructor will discuss work arrangement with the students and walk through the drill. The students will discuss the following points:

(1) Stopping at a point
(2) Smooth pivot with needle down
(3) Utilizing full machine speed for as much of the seam as possible

f. Graduation Drill—Target Time—1 Cycle: 30 seconds (.50 minute)

This drill is designed to bring together all the skills the student has been developing in the first drills. In a sense, all the other drills were helping the student to prepare for this final test.

Drill Summary: The student will begin by simultaneously picking up two pieces, matching the 8" edge, and sewing the pieces together. Upon completion of the simple seam, the work is repositioned, spread open, and the simple seam is topstitched.

After topstitching, the work is again repositioned for a single fold-under, stitching of the raw edges for 7", and stopping. Then the student completes the drill by making a 90° pivot, sewing to topstitch seam, backstaying, cutting thread, and disposing. The order of skills of the graduation drill are the same as the sequence of drills 1, 2, 3, 4 and 5. That is:

(1) Simple seam, two pieces
(2) Topstitch seams
(3) Simple turn-over and stitch
(4) Pivot and backstay

The above skills are in constant demand in the apparel industry; when these skills are linked together with smooth handling skills, good work arrangement knowledge, and acceptable speed, the student will possess skills that are not only valuable, but highly sought after by employers.

Work Arrangement: (Same as Drill #1). The student will place two stacks, 5 pieces per stack, of 8" x 4" cloth pieces to the left and right on the work station top as close to the needle as possible. (NOTE: Remember that this drill will probably require more area around the needle to be clear for repositioning, pivoting, and so on.)

Motion Path: Simultaneously the LEFT HAND is disposing the completed work to the rear and left, while the RIGHT HAND is reaching to and grasping the next piece from the pickup stack on the right. Meanwhile, the LEFT HAND has completed the disposal, reached to, and grasped the next piece from the pickup stack on the left. Both grasps are accomplished as described in Drill #1.

Both hands then align the 8" edges of the two pieces together, with a tolerance of ±1/16", place them under the presser foot, and align to the needle for a 3/8" (±1/16" stitch seam. Sew 8", using proper hand position. Run work out from under the presser foot and cut thread chain on spring knife with LEFT HAND.

Maintain the LEFT HAND grasp and move the work by the LEFT HAND to the left, around and by the presser foot to the sew line. While the repositioning to the sew line is being performed, the LEFT HAND should rotate the work 180° counterclockwise, so that the first seam is to the student's left and directly in front of the needle.

The LEFT HAND will then reach toward the right and grasp the top ply at approximately the middle of the unsewn raw edge. The LEFT HAND moves the top ply to the left, thus opening the work, as the RIGHT HAND pins the bottom ply near the bottom of the right side. Both hands maintain the same position and slide the work to the sewn line. The work is now spread open with the raw edges of the simple seam covered and facing to the left.

The LEFT HAND releases, reaches to the top of the fold-over, and with the index finger exerting slight pressure, palm down, fingers and thumb on top, moves down the fold approximately 4" to assure a smooth, flat fold. The RIGHT HAND continues to hold the right side of the work, with the right index finger on the bottom of the fold. The presser foot should be raised during this motion.

Slide the work to the needle and under the presser foot; using both hands, align the work to sew a topstitch uniform seam 1/16" from the edge of the fold, with no run off of the fold. Sew 8" and cut thread chain on spring knife with LEFT HAND.

After the thread chain is cut, the LEFT HAND, fingers on top and thumb underneath, moves the work to the left. As the work is brought back to the front of the needle, the work is held by the thumb and index finger of the LEFT HAND and flipped upside down with the last 3 fingers of the LEFT HAND, flipping material toward operator. The work is now lying in front of the needle, with previously sewn seams parallel to sew line, raw edges on top, and lying to the left.

The LEFT HAND releases, reaches to the upper left-hand corner of the work, and grasps with thumb underneath and fingers on top, in order to start a 3/8" fold at the same corner. Simultaneously, the RIGHT HAND is grasping the left edge approximately two inches above the bottom left-hand corner of the work, thumb underneath and fingers on top.

The thumb, index, and middle fingers of both hands complete a 3/8" fold of the left edge of the work, as both hands move to the right, matching the 3/8" folded edge to the right raw edge

of the work. As this matching is done and pinned with the index fingers of both hands, the right thumb and middle finger complete the 3/8" fold to bottom. The presser foot is raised during above motion. (The handling is the same as in previous exercises.)

Align fold to the needle and under the presser foot by sliding the work to the needle to sew 1/8" (±1/16") from the folded edge. Sew 7", stopping 1" from the bottom of the work with needle down. Pivot work 90° counterclockwise with the LEFT HAND. The fingers of the LEFT HAND should be to the left of the needle, and the fingers of the LEFT HAND to the right of the needle; sew to within 1 or 2 stitches of the topstitched seam and backstay. With RIGHT HAND using scissors, cut thread and dispose to left front.

Mastery of this exercise means that you have developed considerable skill at handling the industrial sewing machine. It also means that a fine career in the apparel industry should be easy for you.

At this point a visit to an apparel plant can be very helpful to the student. You will find that manufacturers will be most helpful and accommodating in coordinating and assisting you in the orientation and actual visit. Activities to be discussed, explored, and demonstrated in this orientation are:

(1) Show the class a finished garment manufactured by the plant being visited.

(2) Show the class the various parts, components, and trim used in this garment.

(3) Illustrate the sequence of operations and flow of work through the plant. Dependency of each operator on the other in an assembly line operation should also be emphasized (attendance, quality, etc.).

(4) Explain various types skills and skill levels that can be developed by practice.

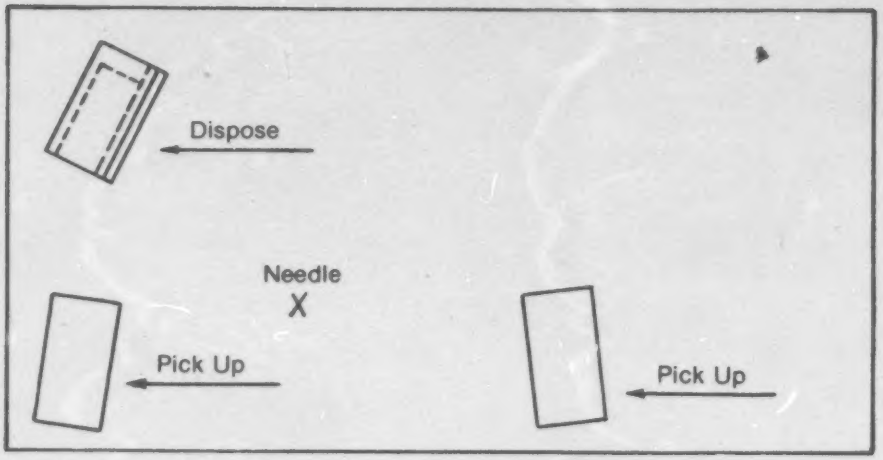
(5) Identify the relationship between acceptable skill speed, quality, employee satisfaction, and desirable working conditions.

(6) Motivate the student to identify machines used in the plant and to identify sewing skills learned on the machine in the classroom that can be transferred, in most all cases, to the machines in the plant.

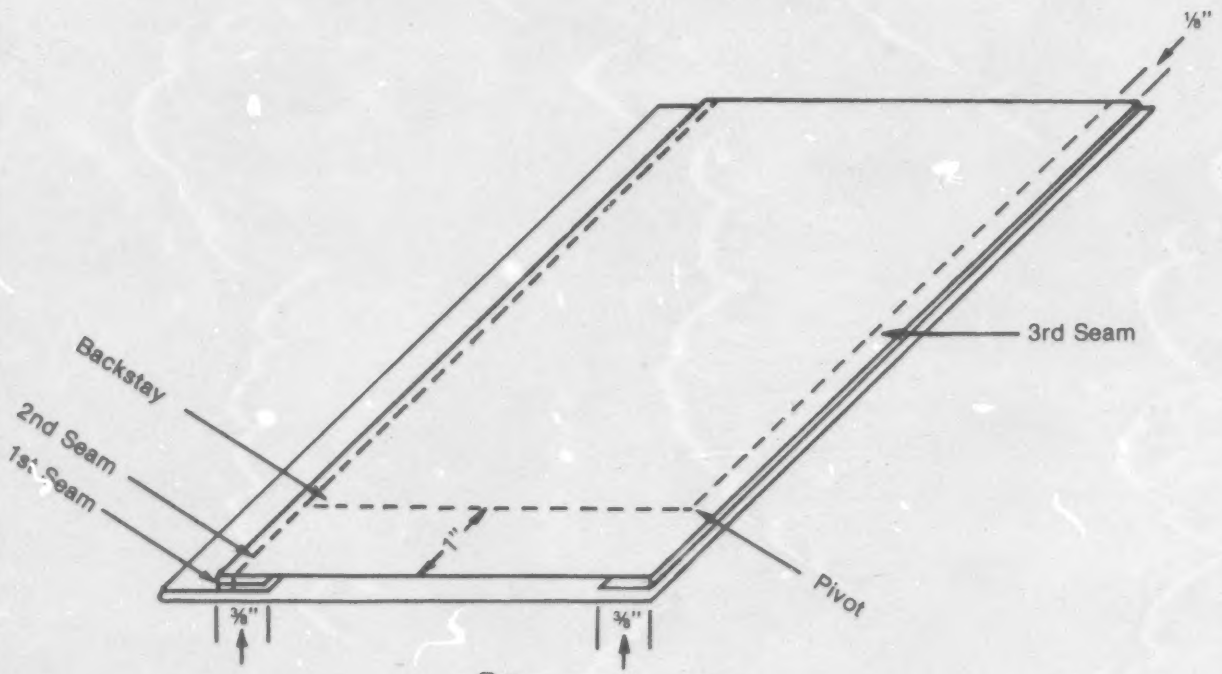
Most manufacturers will gladly supply you with a person capable of assisting you in this orientation the day before the visit. They will have likely used a similar orientation with visitors many times in their plant. There should be a time set aside both in the plant and back in the classroom for answering questions which the student will have regarding the visit and the industry.

TARGET TIMES: ONE CYCLE - .50 min. (30 seconds)
5 REPETITIONS - 2.50 min.

WORK PLACE



SEAMS



UNIT VII

GAUGES AND FOLDERS

Introduction

Gauges, folders, and work aids are designed to assist the operator to control the material, maintain uniform stitch margins, and to bend or form the material to a specified shape. Uniformity is necessary when garments are mass-produced.

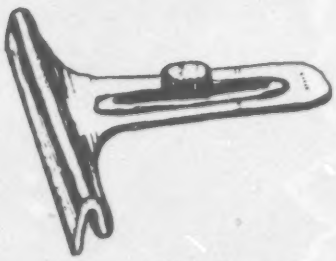
Stitch margins (seam depth) must be strictly maintained in order to prevent oversizing or undersizing garments. All folds and seams must have the same appearance in order to conform to the requirements of the designer. The instructor will demonstrate the proper use of three bed-type and one foot-type width gauges.

Width Gauge

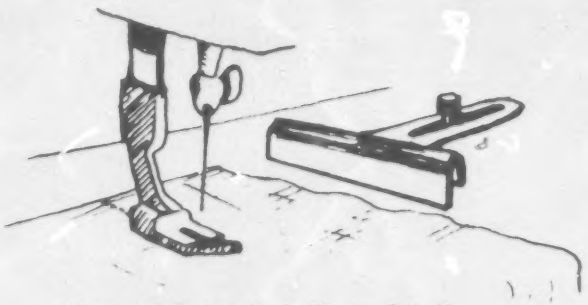
Probably the simplest of all attachments, both in appearance as well as in use, is the marginal width gauge. Its name tells us its prime use—to enable an operator to sew a seam and keep the row of stitching a specified width from the edge of the material.

When you first learn to sew, you use "sight lines" to keep your seams straight. But sometimes an operator needs a more positive point for sighting an exact width. We can roughly sight a 1/4" seam, but if the seam were to be 5/16ths of an inch, then you can see why the operator would need something more positive to use as a guide.

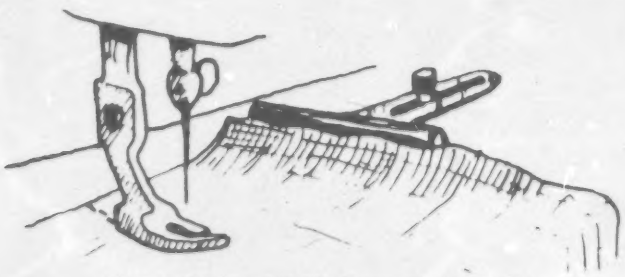
The average material is not stiff enough to hold its shape when pressed against the side of a gauge. Therefore, it is the responsibility of the operator to see that she does not feed the material short of the wall of the gauge, which will result in a seam depth or stitch margin that is too narrow, or up the wall of the gauge, which will result in an uneven seam, as well as a seam or stitch margin that is too deep.



Width Gauge



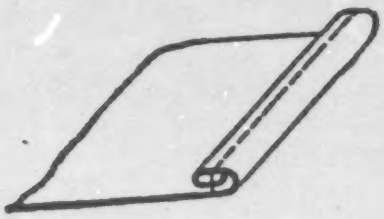
Material Being Fed, Short of Wall



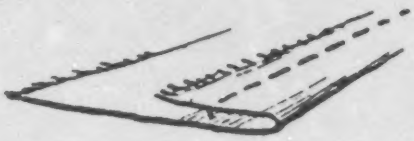
Material Being Fed, Beyond the Wall

70

This principle holds true of all attachments; they are built with the assumption that the operator will always feed the material into the attachment properly. The attachment will not serve its purpose if the operator does not use it properly. In the case of a simple hemmer, look at what can happen:

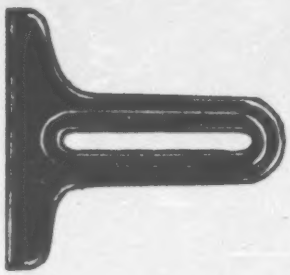


When Fed in Properly

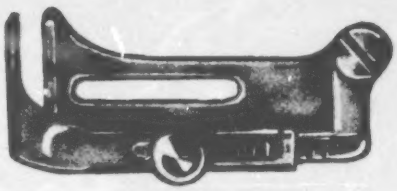


Raw Edge Showing When fed in short, not enough material to fold under.

There are two main types of width gauges. One type, the bed type, is attached to the bed of the machine by using a thumb screw or slotted screw. The other type, the foot type, is made as a part of the presser foot. Perhaps the bed type of gauge is more popular, since it allows greater flexibility. The foot types are used mainly for more narrow seams. Many varieties of bed-type width gauges are made, but the three following bed types are used most often:



Single Setting



Double-Margin Setting

Multi-Margin Setting

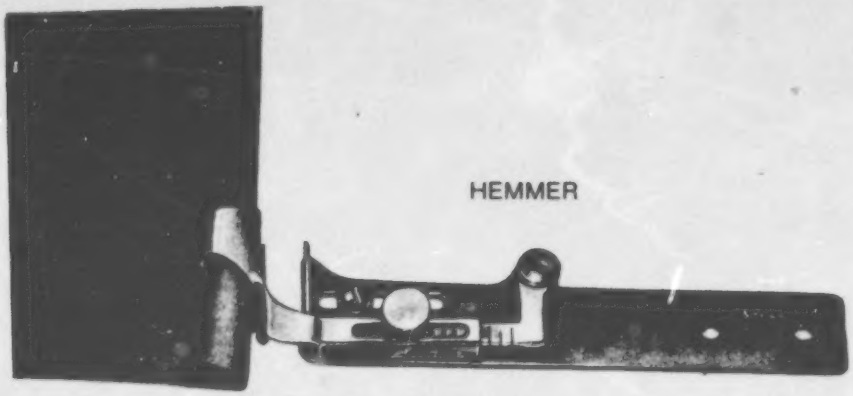
All of these are attached to the bed of the machine with screws which fit into the open slots. They are set at right angles to the line of stitching. Once a single-setting gauge has been screwed down, the operator sews only one width setting. The double-margin gauge has a double margin setting. You will note that there are two walls on this gauge. The front wall (on the left) is attached to an arm which can be swung away by the operator without unscrewing the gauge. She will have a different margin setting remaining on the fixed arm or second wall.

The front arm of this gauge has an adjusting screw so that the operator can set the two walls at any distance apart. For example, the first wall may be set for a 3/8" width, and the second or inner wall may be set for 3/4" width. This gauge is used only when the operator must change the width of her seam, or when she uses the front gauge only and swings the arm out of the way to sew without any gauge at all. For this reason it is sometimes called a swing gauge.

The butterfly gauge has three different types of edges and is used when the work being fed in has both straight and curved edges. The position of the gauge in the picture indicates that it is being used for a straight edge.

Folding Attachments

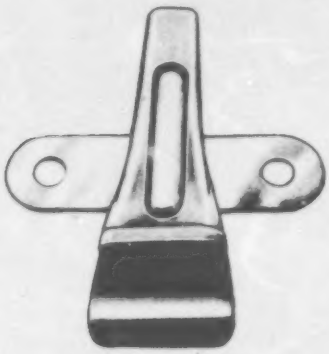
There is a close relationship between a hemmer and a folder. However, a hemmer usually folds only one ply of material in order to put a finished edge on garment openings, such as skirt bottoms, sleeves, cuffs, etc. It may also add some form of trimming to that one ply.



HEMMER

A folder can perform basically the same job that a hemmer performs, but it does the job with more than one ply of material—for example—adding a binding to an edge. Tape, lace, rick-rack, or other decorative edging can be added at the same time.

An example of a folder is the strap folder, which takes strips of material and folds them into sharp form. Note that both single and double needle machines may be used. Also note that some edges look like regular hemmed edges.



The Strap Folder

Some strap formations from this type of folder

Learning Experience

The students will demonstrate the use of each of the gauges and folders mentioned in Unit VII and will learn to use them according to standards of competence established by the instructor.

UNIT VIII

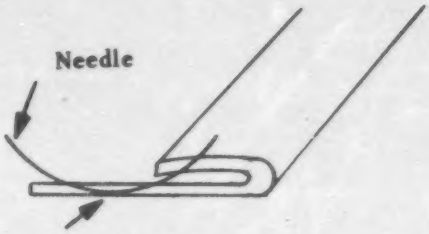
OVERVIEW OF OTHER MACHINE TYPES

Blindstitch Machines

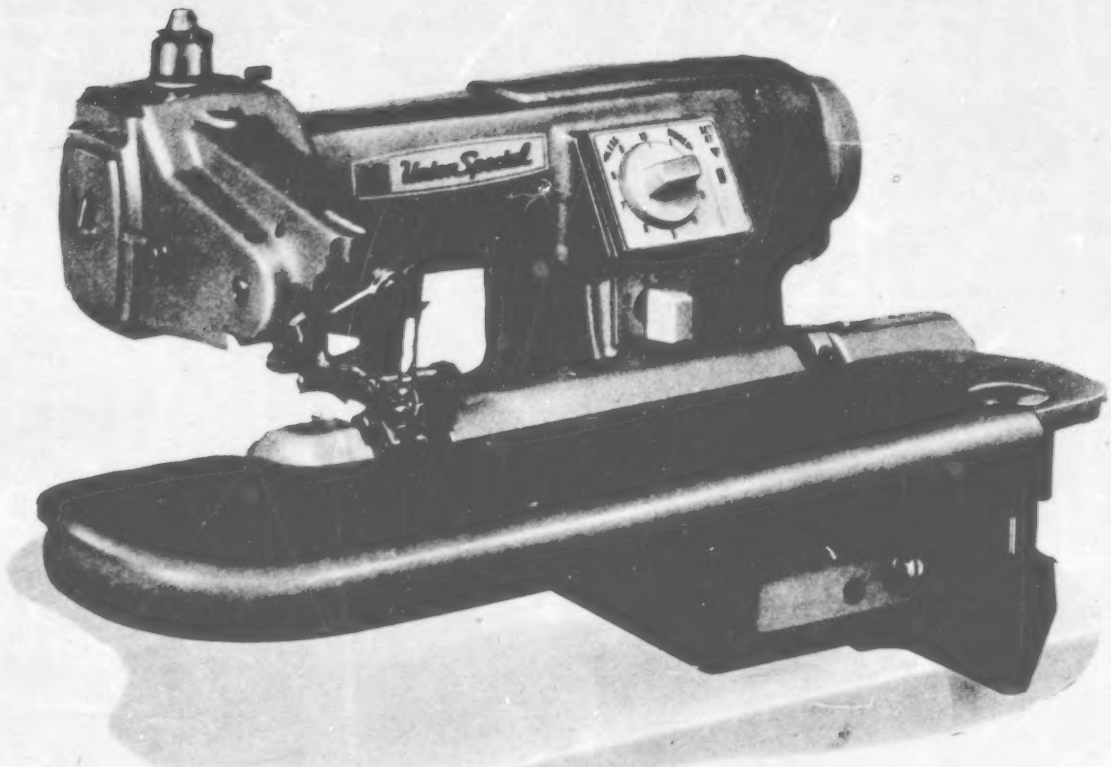
One of the most ingenious machines and probably the closest in effect to hand sewing is the blindstitch machine. When made properly, the blindstitch is hardly visible on one side of the cloth or hem. Naturally, this machine is used to give the appearance of a handmade hem or seam.

To understand how this is possible, look at the formation of single stitch, using a curved needle:

Direction of needle



Needle penetrates only partly through



BLINDSTITCH MACHINE

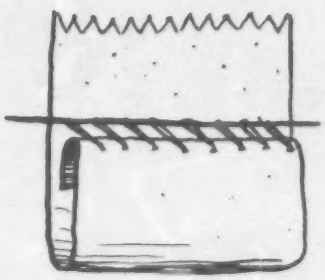
We can see that the secret of the blindstitch is that the curved needle penetrates only partly through the one ply of material, making it blind on the face side of that ply. Most skirt and dress hems are finished in this fashion.

But before we go any further, we must understand that since not all materials are of the same thickness, the machine must be adjusted to take the exact thickness of the material that we are sewing. If the material is very thin, like a summer cotton, it is impossible to adjust the machine so that the needle will penetrate only partly through the cloth. In this case, it is not really a blindstitch, in that it is visible from the face side of the cloth. However, due to the spacing of the stitching and the small amount of thread that appears on the surface, it is still a very desirable effect. We must also guard against the needle's taking such a shallow bite of the material so as not to penetrate at all. This is the same as a skipped stitch, and the two plies will not be held together.

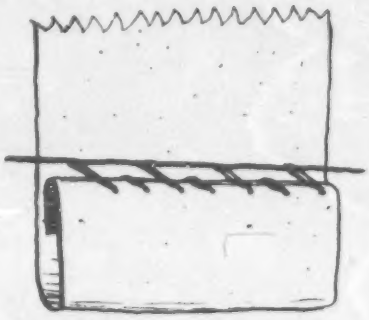
On thin material needle must penetrate

Needle set too shallow to catch bottom ply

So far we have discussed only the adjustment for penetration of material, but the blindstitch machine can also be adjusted for stitches per inch (S.P.I.), and in this case the S.P.I. serves a double purpose. First, the S.P.I. affects the appearance of the seam; second, and more important, a high S.P.I. can also produce an overedge seam to cover the raw edges of a ply. In that case the stitches are set very close together and give the effect of an overedge or serging machine. When this is necessary, the machine can be adjusted so that it will skip the penetrating depth on every other stitch, but will still catch the top ply.



Overedge Feature



Overedge and Skip Stitch

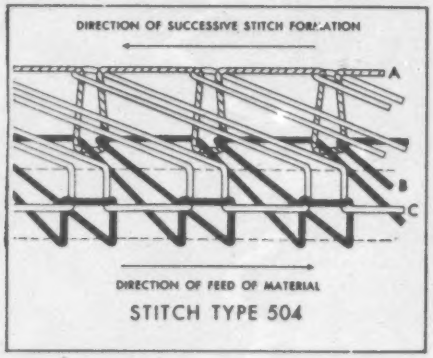
Learning Experience: After the students read the instructional materials and observe the pictures explaining each blindstitch machine operation mentioned, the teacher will demonstrate the proper techniques to use in operating the machine. The students will practice performing the operation and will be evaluated by other students and by the instructor according to criteria established by the instructor.

The two following questions will be discussed:

a. What types of materials give the most effective blindstitch?
b. In what way do blindstitch machines differ for different operations?

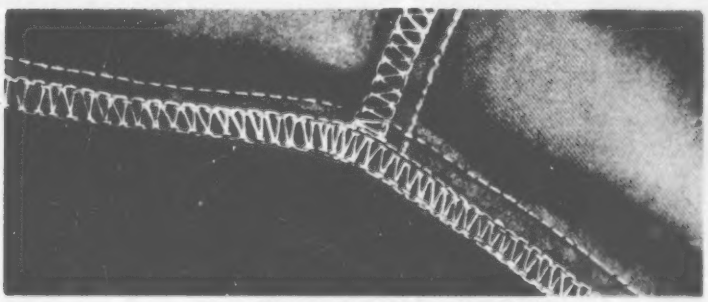
Overedge and Serging

Here again we have a type of seam which is considered finish stitching, but it is not visible on the finished garment when it is worn. The word "overedge" describes this seam perfectly, in that the finish covers the edge of the material. When serging is used to overedge and seam at the same time, there will usually be more than one thread. Sometimes as many as five or six threads will be used to make one seam. These types of seams are used frequently on knitted fabrics to allow elasticity in seams.



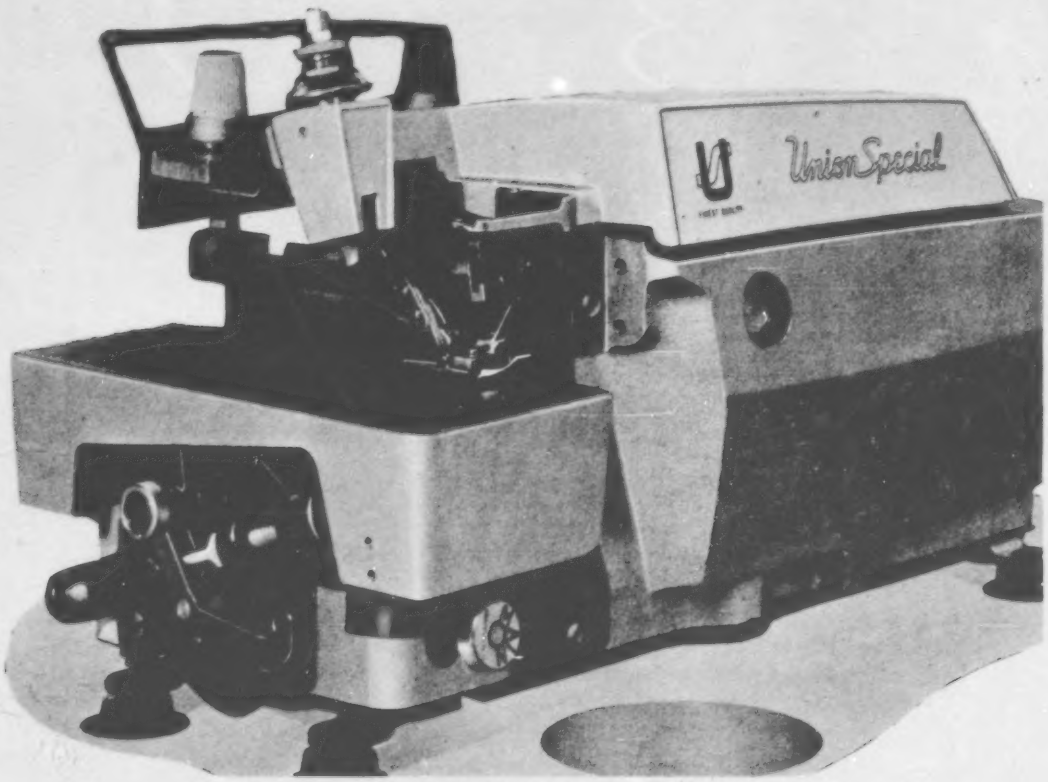
STITCH TYPE 504

Another form of the overedge seam is similar to those previously shown except that an additional row of stitching is added at the same time. This is usually referred to as a row of safety stitching. This seam acts as a plain seam and reinforces the overedging of the plies.



SAFETY STITCH

In order to overedge material, it is important that the edges of the plies be straight and even; therefore, most overedge machines will have a trimming attachment which will trim the edges evenly before they reach the needle. The average overedge machine is usually very compact. Indeed, its size is deceptive considering the sewing job it does. (The instructor should demonstrate the machine and instruct each student to use it.)



OVEREDGE MACHINE

Automatic and Cycling Machines

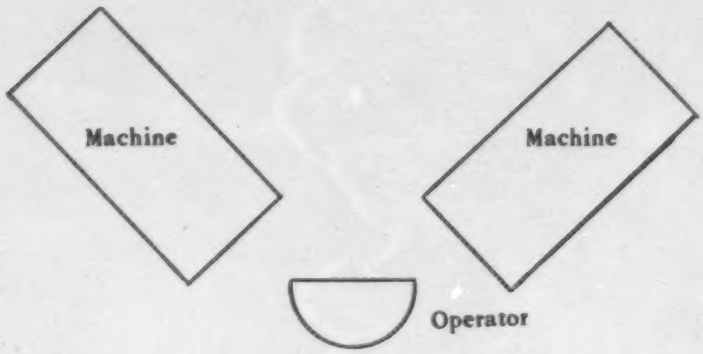
It is a rare shop indeed that does not have one or more automatic machines. The number of automatic machines used in a shop will be determined by the garments the shop produces. However, the average shop will have one automatic for every 15 or 20 regular sewing machines.

To understand what we mean by automatic machines and where they are most often used, we must understand the following kinds of operations that are performed on these machines: (1) making of buttonholes and (2) sewing on of buttons. From this we can see that these are specialized operations that cannot be done on regular plain sewers.

We call these machines automatic because the operator does not do any feeding of material as she would on a regular machine. The main function of an operator using one of these machines is to place the material under the work clamp (similar to a presser foot). She then presses a button or a pedal, and the machine makes the sewing design by itself.

Therefore, it is easy to see that there is not much skill required to be the operator of one of these machines. The only skill needed is to properly center the work before pushing the button.

We use the word "cycle" with automatic machines. "Cycle" means the entire sewing operation, from the time the machine is started until it completes its sewing design. The time it takes to complete the sewing operation is called the time cycle. On some machines, when the time cycle is long enough, it is not unusual for an operator to run two machines at once.



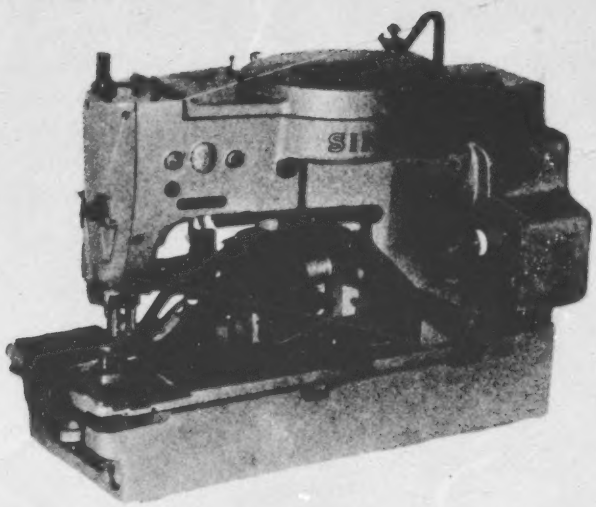
We see here a typical setup for an operator to run two machines at once. For example, if these machines have a ten-second cycle, while one machine is sewing, the operator has ten seconds to remove the work from the other machine, insert new work, and start the machine before the first machine is through with its cycle. Ten seconds is a long time for a sewing operation, and if you will just pause right now and count to ten very slowly, you will realize that it is enough time to perform the operation outlined above. After all, if the operator runs only one machine, she will have to sit and wait for the cycle to be completed before she can proceed.

There is also available a machine which will sew all of the buttonholes on a shirt-front in one operation. The machine spaces the button-holes and makes them automatically, and then stops when it has completed all the buttonholes for the shirt. Here again, an operator could operate more than one machine, since the sewing cycle is very long. In this particular operation, the operator stands up and walks from machine to machine.

In the machines we have discussed above, the operator is required to do some work. There are still other machines which do not require an operator at all. These machines, rather than performing a specific operation such as a buttonhole, perform a continuous operation such as making tape, belt loops, belts, hangers, etc., which are made endlessly and are then cut off at the desired lentgh. The only attention these machines need is to change a bobbin or put on a roll of material. One operator can watch as many as ten of these machines.

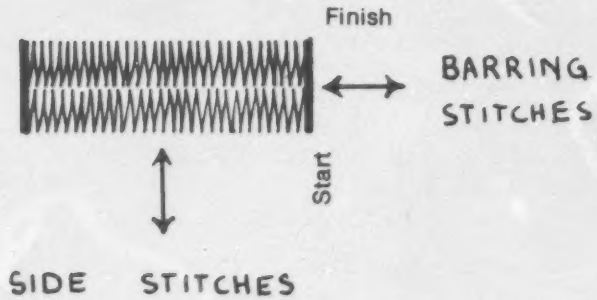
At the beginning of this lesson we said that most automatic machines do not require an experienced operator. However, you might be called upon to run one of these machines someday, and it is important that you know their function and use.

Straight Buttonhole Machine

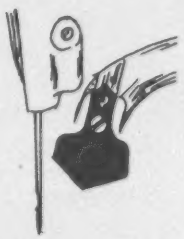


BUTTONHOLE MACHINE (271K)

Most of us take a buttonhole for granted, not thinking about how it is formed on a machine. On some home machines, it is possible to add a buttonhole attachment, but still the operator does not know how the buttonhole is actually formed. There is a difference between the home variety buttonhole and the one made in the factory on an automatic machine. Let us examine the sewing pattern of the buttonhole machine.



BUTTONHOLE



NEEDLE AND KNIFE

All of this is done with the aid of a cam which changes the stitching pattern at each point. The length of the buttonhole and the width of the bite on each side are easily adjustable and can sometimes be accomplished by the operator. However, in a factory making a certain type of garment, these settings will not be changed very often. It is also possible to adjust the space between the two rows of zigzag stitching.

The closeness of the zigzag stitching on S. P. I. can be adjusted easily, as can the number of barring stitches at each end of the button-hole. All buttonholes can be cut automatically. In the straight buttonhole, the cut is made after the buttonhole is finished and is called a "cut-

after" buttonhole. However, there are machines which cut first and then sew around the edges of the cut. These are called "cut-before" buttonholes. Unless the material has considerable body, a cut-after hole will be used, since the material would gather and pleat under the zigzag stitching. The cut-after buttonhole is completely sewn and the stitching finished before the knife comes down.

The actual cutting is done with a knife that is located just behind the needle bar. The knife cuts through a slit in the bed of the machine. When work is placed on the bed of the machine, the work is placed directly under the knife. The knife does not move in any direction except up and down. The length of the knife must be changed if the length of the buttonhole is changed.

The buttonholer has a clamp to hold the work down. In the center of the clamp is a stitching area. If the buttonhole has been premarked with chalk or crayon, the mark must be in the exact center of the sewing area. Once the machine has started its cycle, it is possible to stop it anywhere in the cycle by pressing a "panic" button. When the machine is started again, it will continue from the same point at which it was stopped.

The reason for the panic button is apparent. If you had a thread breakage, there would not be any point in allowing the machine to continue its cycle beyond the point where it stopped sewing. On most machines there is also a lever which will stop the knife from cutting in the event that you want an uncut buttonhole. When there is thread breakage or any other reason why you would stop the machine with the panic button, it is wise to remove the work and test the machine with scraps before placing the work back in the machine.

Like most automatic machines, the buttonholer has automatic thread cutters which cut the top as well as the bottom thread at the end of its sewing cycle. When operating this machine, be sure the cutters are working properly; otherwise, when removing your work, you can easily break the threads and cause trouble. The average buttonholer has a bobbin, and it too must be watched so that it does not run out in the middle of the cycle and cause you to push the panic button.

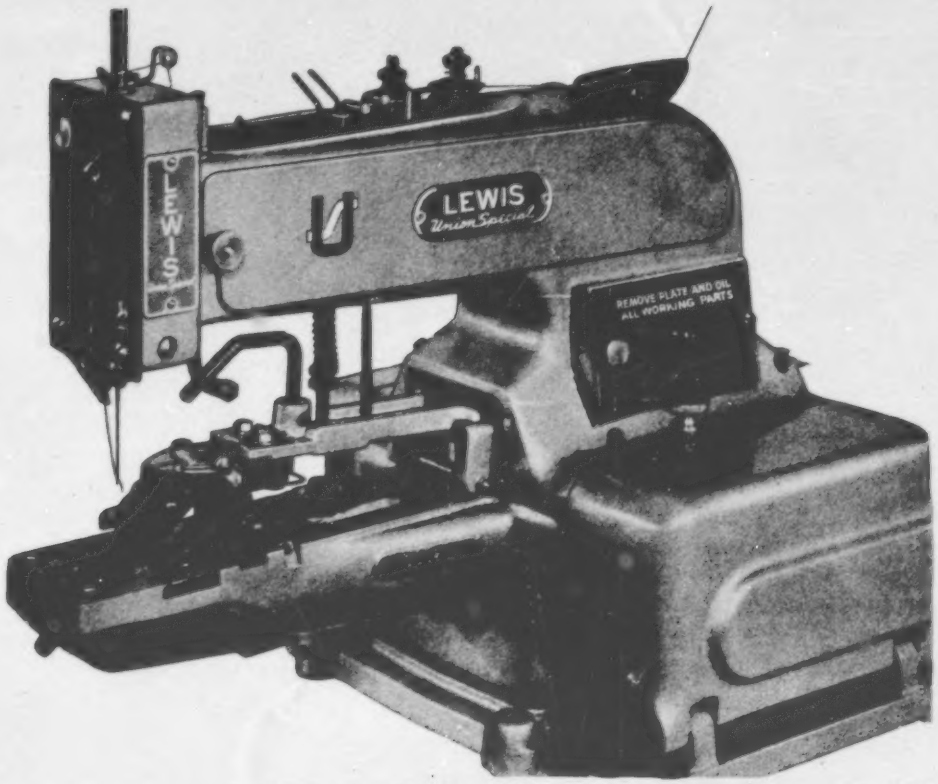
Learning Experience: After watching demonstrations by instructors, reading instructional material in Unit VIII, participating in discussions, and operating different types of machines, select scrap material at least two or three plies thick. Mark four or five buttonholes and proceed to make them on the straight buttonhole machine. Practice using the panic button. Remove the work; then return the work and place it so that the buttonhole will be completed without a sign that it had been interrupted. The instructor will check your work and will evaluate it according to standards set by the instructor.

Automatic Button Sewing

If you have ever sewn a button on by hand, you will appreciate the efficiency and speed of the automatic button sewer. The button-sewing stitch is merely a zigzag stitch. It may be either lockstitch or single thread chainstitch. Since the machine is automatic, it will sew a specified number of stitches a preset distance apart. This is even used as a bar tack machine in some shops. But if the machine makes these stitches through the holes of a button, we can see how it will sew on buttons as well.

Since most buttons are either of the two-hole or four-hole variety, the average machine is adjustable to sew either of these types. It is also convertible on certain varieties to sew a shank button, since the sewing action is the same, the main difference being in the way the button is set into the clamp before sewing.

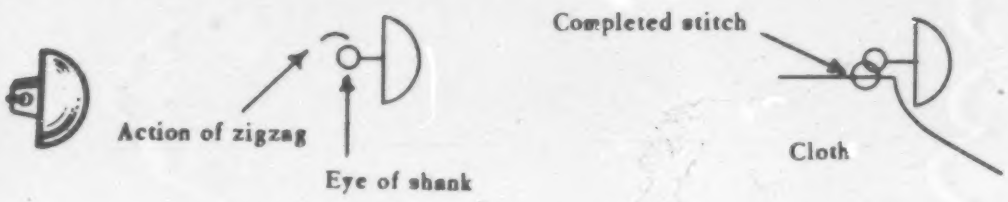
The button sewer has a raised or cylinder bed, since many buttons are in inaccessible places, and with a raised bed it is possible to get at any area on a garment. The operator merely places the work under the clamp and at the same time places the button in the jaws of the clamp. When the machine is started by the pedal, it will sew the button automatically and cut the thread at the end of the sewing cycle.



BUTTON SEWING MACHINE

This photograph shows the raised bed of the machine and also the clamp with the jaws spread apart, holding a button.

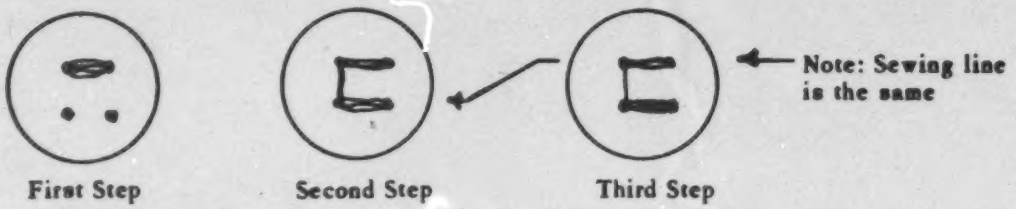
The jaws are spring-controlled, so that the button can be pushed in and still be held by the jaws. However, since buttons come in many sizes*, the jaws can be adjusted to hold small or large buttons. When shank buttons are used, the jaws are replaced with an attachment which holds the button on its side so that the hole in the shank is presented to the needle in the same manner as a flat button.



*Button measurement is usually defined as ligne, i.e., 40 ligne button=1" diameter.

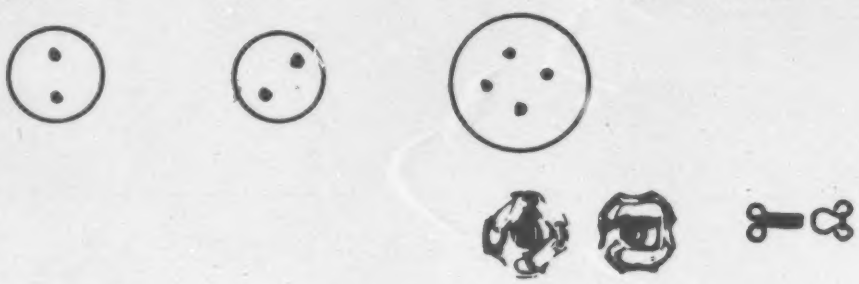
For the above button the machine would sew in the same manner as for a two-hole button. Many regular buttons have four holes, and for these, the machine will sew the four holes in two different sewing motions. The changeover from two- to four-hole buttons is a very simple change on the machine and can be done by the operator in two or three seconds. (Refer to machine manual.)

To make the four-hole sewing pattern, the machine will sew the required number of stitches in the top two holes and then shift the clamp, the work, and the underclamp so that the buttom two holes are then under the needle. In other words, the needle bar does not shift forward, but the work does. The machine sews the two bottom holes and returns to the original position.

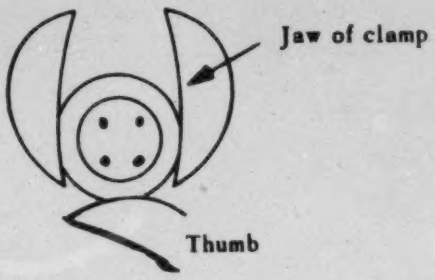


The width of the bite can be adjusted to fit a large variety of buttons, and the distance between the top and bottom rows can be adjusted.

On this particular machine the operator is concerned with (1) placing the work under the clamp at the exact spot where the button is to be sewn and (2) placing the button into the clamp. She must be absolutely certain that the holes in the button are lined up under the needle. Buttons set into the clamp in any of the following ways will only cause the needle to break.



After studying and observing the operation of the button machine, it is easy to convert the machine to sew snaps, hooks and eyes, and other items. This machine can do many jobs. When the operation is highly standardized and the production is great enough, a hopper feed can be added to this machine so that the operator does not have to pick up and then place a button in a clamp. The hopper allows one button to come down at a time and drops it into the clamp; the operator has merely to line up the button before starting the machine.



Since the clamp holds the button with the front edge open, the operator merely rotates the button in the clamp with the thumb until the holes are lined up properly.

Learning Experience: Use scrap material of at least two plies. Operate the machine without buttons and observe the bar tack it will produce. Start sewing buttons. The following procedure will help you make fast production on this machine: While the machine is in cycle, the operator will pick up the next button and have it ready to insert in the clamp as soon as the previous button has been sewn. She will also have the clamp raised and the work replaced for the next button. She will then insert the next button.

APPENDIX A

SUPPLEMENTAL INFORMATION FOR TEACHERS

Suggested Methods of Instruction

We learn by the use of our five senses: seeing, hearing, feeling, tasting and smelling. The senses we use most are those of seeing and hearing. Psychologists estimate that 90% of all we learn in life is from what we see and hear. Therefore, careful observation and good listening are essential to success.

It has further been proven that people retain most when they are given the opportunity to practice DOING whatever it is they want to learn and retain. Therefore, we recommend the following methods of instruction:

1. Written and oral instructions will be given by the instructor.
2. The instructor will demonstrate the steps discussed.
3. The students will perform the exercise demonstrated.
4. The instructor will give the students an opportunity to practice; individual instruction will be given as needed.
5. Basic instructions and demonstrations will be repeated until students are capable of completing the unit of work in a satisfactory manner.

Learning is a step-by-step process. It is easier to learn a simple task and master it before moving on to the next step than it is to learn something rather complicated all at one time. Therefore, in this course the sewing operation that we ultimately want the student to learn has been analyzed, the elements that make it up have been separated, and the student will be taught each of them separately. When the student is able to perform each element, the elements will be combined, and the student will learn to perform a complete cycle. This is the exact method that progressive companies in the industry are using to train their employees. So when the students go to work, they will be ahead of other trainees with whom they are competing for full-time employment.

Tips for Developing Good Listening Habits

More time is spent in listening than in any other communication skill. Although we frequently think we are listening, we are not; we can't remember what was said. This is because it is so easy to let out minds wander while we appear to be interested and concentrating on what is being said. We can listen at a rate three times as fast as we normally hear, without loss of comprehension, yet we are only 25% effective in our listening.

Here are some tips for developing good listening habits:

1. Clear your mind of personal problems and concentrate!
2. Avoid faking attention. Don't just look. Listen!
3. Listen as though you were going to be tested on the material discussed.
4. Take notes, but don't try to take notes on every word that is said.
5. Be careful to keep your thought speed at pace with speech speed. Don't let your thoughts linger too long on any one point, or you'll miss the next.
6. Don't evade difficult material. Try your best to understand.

7. Disregard the delivery of the speaker or what is going on around you. . .listen to what is being said.

8. Ask questions when you don't understand. If it isn't appropriate to interrupt, jot down a note and ask the question later.

Responsibility

An industrial atmosphere requires that certain rules and regulations be followed to insure an organized work flow. Some of these rules may be the same as those we follow in the classroom. Others you will find to be unique to the industry.

Therefore, to be a responsible student, or to be a responsible employee, individuals must become acquainted with the rules. Accepting responsibility can be measured by the way we perform our work. Few who "just get by" are given opportunities for advancement. The person who takes the ball and runs with it will get recognition from the people who count.

Punctuality is often used as a basis for evaluating an employee. A hard-working, diligent, dependable employee with acceptable skills is much more valuable to a company than one with better skills, but who is not dependable. Being on time is often construed as evidence that the employee likes his work and wants to be there. Employees who are habitually late to work or absent are destined for discharge, no matter how superior their skills. Tardiness and absenteeism are major criteria companies consider in evaluating employees during their training period. Most companies check attendance records along with other pertinent information when checking references of candidates for employment. Attitudes are important, too. Have you ever been told that you have a "poor attitude" or a "good attitude?" The person with the positive attitude is the one who is going to have fewer personal hang-ups and will achieve a better relationship with other people. It is possible for individuals to adjust attitudes.

Understanding Why People Act as They Do

People who have studied human relations have discovered some guidelines that might help people to know other people, but the need to discover and know ourselves is even more important if we contribute constructively to society.

1. People want recognition. All of us, even a hermit in a cave, want to be noticed by others. We thrive on attention. Our day is brighter when a person goes out of his way to compliment us.

2. We want to be treated fairly. It is of utmost importance that people get a "fair shake." People who have the art of getting along are those who treat others equally with a minimum of partiality.

3. People want to act intelligently. They want to solve their problems in a meaningful way, to reason out possible solutions, and then act on them. There is a need to understand that we do not all see things in the same way. We do not want, admire, or reject the same things that others may.

Mental Maturity

When we ask the question, "Why does she act silly?" we are really saying, "Why doesn't she act in a mentally mature way?" Mental maturity is the conscious art of behaving in a way that is acceptable to others with whom we associate. The criterion of the mature personality is the degree to which individuals can relate themselves to an ever-widening area of experience, relationships, and responsibilities.

People are mentally mature when they:

1. Accept responsibility and stick to a job until it is completed.
2. Know their goal and work toward it by thinking for themselves.
3. Admit that good relationships with others means giving and receiving consideration and understanding.
4. Express their emotions in a constructive way.
5. Are sensitive to the feelings of others.
6. Are aware of the effect of their behavior on others.
7. Enjoy being with people, but also enjoy being alone.
8. Are flexible.
9. Follow directions and take criticism without being offended.
10. Have a sense of humor properly directed toward themselves and toward others.
11. Avoid offending co-workers by practicing personal hygiene habits, such as using breath deodorants, bathing and using body deodorants daily, wearing clean clothes and keeping well-groomed.

Opportunities for advancement into supervision are very good in this industry for those who demonstrate responsibility and mental maturity.

Additional Orientation Sources

1. The showing of "The World of Apparel" is recommended at this time. This film (approximately 20 minutes showing time) may be obtained through purchase or on loan from the A.A.M.A.

2. Your local apparel manufacturing companies may provide you with additional material of interest to your students.

APPENDIX B

APPAREL INDUSTRY ORIENTATION FOR THE TEACHER

Students participating in this course should have an understanding of various aspects, facts, and figures of the apparel industry in order to appreciate the opportunities available. This unit describes the composition of the industry, its history, and how it operates. Teachers are encouraged to: (a) study and interpret this information, (b) develop student learning materials based on this information, (c) plan learning experiences that are appropriate for the learning level of the student, and (d) the AAMA film, "World of Apparel," could be shown the first week or two of the course.

The apparel industry has grown to a position of tremendous importance in the American economy according to an AAMA publication, Focus, Economic Profile of the Apparel Industry. In 1969 the Department of Commerce reported that the apparel industry contributed $8.9 billion to the national income. This represents 1.1% of income generated by all sectors of the economy and 3.9% of income from the manufacturing sector.

The following table documents geographic information on the apparel industry. This table groups the 50 states into census regions and geographic divisions of the United States. It can be seen that almost 44% of the larger plants are in the three states of the Middle Atlantic region. Also, over three-fourths of these plants are in four regions made up of 21 states. A relatively large number of plants are very small and could tend to distort the picture. Therefore, an arbitrary point of plants with 50 or more employees was used to highlight this information.

It should be emphasized that these comparisons should in no way minimize the importance of any region, separate states, or for that matter, individual plants. Each is a part of the total apparel industry, and the need for trained people and educational programs is the same regardless of plant location.

At this point in the course it would be meaningful to provide some history and information on the local apparel industry. Such facts and figures that would be important can usually be secured from local apparel manufacturers and the Chamber of Commerce. Informing the student on the local apparel industry also provides valid information concerning employment opportunities.

Annual sales from the ten largest firms would represent a very small percentage of total industry sales, as all firms vie for a share of the consumer dollar. Growth opportunities are good, and some of the firms that were considered small a few years ago are today large, by industry standards.

Additional information for course material on industry background and job opportunities can be found in various reports and publications which can be secured from AAMA in Arlington, VA.

APPAREL INDUSTRY EMPLOYMENT AND PLANTS

BY CENSUS REGIONS AND GEOGRAPHIC DIVISIONS

Middle Atlantic (3 States) NJ/NY/PA	552,699	3,068	43.4%
South Atlantic (8 States) DE/FL/GA/MD/NC/SC/VA/WV	268,639	1,283	18.2%
East South Central (4 States) AL/KY/MS/TN	169,178	606	8.6%
New England (6 States) CT/ME/MA/NH/RI/VT	79,129	508	7.2%
East North Central (5 States) IN/IL/OH/MI/WI	100,643	427	6.0%
Pacific (5 States) AK/CA/HI/OR/WA	82,965	425	6.0%
West South Central (4 States) AR/LA/OK/TX	87,793	381	5.4%
West North Central (7 States) IA/KS/MN/MO/NB/ND/SD	51,760	298	4.2%
Mountain (8 States) AZ/CO/ID/MT/NV/NM/UT/WY	12,056	66	1.0%
Total	1,404,862	7,062	100.0%

APPENDIX C

GENERAL REQUIREMENTS FOR ESTABLISHING AN APPAREL MANUFACTURING COURSE IN INDUSTRIAL SEWING

This section is intended to provide some guidelines for use in establishing the particular type of industrial sewing course needed. Even though this student-teacher guide was designed with high school vocational training in mind, it is flexible enough to use in adult occupational training. It is recommended that this guide be used as a student textbook.

Length of the Course

The material furnished in this guide offers a flexible curriculum which can be expanded or contracted depending on the time available and the complexity or depth needed for the course.

For HIGH SCHOOL VOCATIONAL TRAINING here are several approaches for course design, using the 180-hour suggested classroom curriculum. It is important to set up a local industry advisory board to help select the proper course design and to help you with equipment selection. AAMA will be glad to give you the names of member companies in the area.

Senior Year—Industrial Sewing (1-year Co-Op Program)

Method A (2-hour sessions):

Two nine-week quarters of regular high school in the mornings and industrial sewing class in the afternoons.

(2 hours a day—5 days a week—18 weeks) 180 hours

Two nine-week quarters of regular high school in the mornings and cooperative job experience in local industry in the afternoons. (Accumulative 4 1/2 weeks of actual job experience.)

(2 hours a day—5 days a week—18 weeks) 180 hours

Total industrial sewing class and job experience = 36 weeks or 360 hours

Notes on Job Experience

If local industry job experience is not practical, then class hours can be expanded, and sewing projects can be instituted for the remaining hours. This could be industry-style construction of whatever garment is predominantly made in the local area. A local manufacturer should be glad to furnish you with the cut parts of a single garment (2 or 3 dozen) and a make-sample. Then with some supervisory help from the local apparel plant and perhaps some borrowed gauges and folders, each student might specialize on one or more operations on each garment, depending on the size of the class. No one should make the entire garment, since that is not the industrial method. Reasonable timed targets should be set up for each operation to get the feel of industry piece rate pacing.

If cut parts cannot be obtained from local industry, then design a simple apron to utilize the equipment you have, cut several dozen in the classroom, and set up your own assembly line with timed targets.

Method B (3-hour sessions):

Three months of regular high school in the mornings and industrial sewing class in the afternoons.

(3 hours a day—5 days a week—12 weeks) 180 hours

Six months of regular high school in the mornings and cooperative job experience in local industry in the afternoons. (Accumulative nine weeks of actual job experience.)

(3 hours a day—5 days a week—24 weeks) 360 hours

36 weeks 540 hours

Junior and Senior Years (2-year Co-Op Program)

Method A could be moved to the junior year in high school, and the senior year could be:

(4) Nine-week quarters of regular high school in the mornings and cooperative job experience in local industry in the afternoons. (Accumulative 4 1/2 weeks of junior year, plus 9 weeks senior year, totaling 13 1/2 weeks of actual job experience upon graduation.)

(2 hours a day—5 days a week—36 weeks) 540 hours

Method B could be moved to the junior year in high school, similar to Method A above, except that the senior year would contain:

(3 hours a day—5 days a week—36 weeks) 540 hours

(This would be an accumulative 9 weeks of junior year actual job experience, plus 13 1/2 weeks senior year, totaling 22 1/2 weeks of actual job experience upon graduation.) Much of this actual job experience may be paid for by the local company at special student-learner permit rates. (Title 29, Part 520, Dept. of Labor Code of Federal Regulations)

As you can imagine by now, there are many more ways this course material can be arranged in the high school program. It would be advantageous to use parts of this course and a few industrial sewing machines in the high school home economics courses to familiarize students with the career opportunities.

In OCCUPATIONAL TRAINING outside of the regular school curriculum this same student-teacher guide can be used for any number of different length programs, with one major difference. The difference is that there would be no actual job experience until after the course and until the student actually found a job.

Here are several approaches to occupational training programs outside of the regular school curriculum and utilizing approximately the 180-hour suggested industrial sewing classroom curriculum:

A. 4-week Course: 8-hour day—5-day week (40-hour week) = 160 hours
B. 6-week Course: 6-hour day—5-day week (30-hour week) = 180 hours
C. 8-week Course: 4-hour day—5-day week (20-hour week) = 160 hours
D. 9-week Course: 4-hour day—5-day week (20-hour week) = 180 hours
E. 12-week Course: 3-hour evening course Monday through Thursday—4-day week (12-hour week) = 144 hours
F. 12-week Course: 3-hour evenings Tuesday, Wednesday, Thursday, plus 6 hours Saturday (15-hour week) = 180 hours

Facility Design and Preparation

Page no. 96 contains a suggested layout or floor plan of a sample industrial sewing classroom. In this sample there are 12 basic sewing machines. Each student may have his own machine, or two students may share one machine time and and help each other. Therefore, this sample classroom will hold from 12 to 24 students.

a. Floor Space
The basic sewing machine requires about fifty square feet per machine. Then add for several sections 5' wide x 4' of cutting table and a desk for the teacher. The cutting table can be used as a work table and cutting table, if necessary.

b. Power
110-volt, single-phase, and 220-volt, 60-cycle, 3-phase power sources are required, and an overhead power rail for the 220 volts to the machines is suggested. Four rows of power rail each 32 feet long would be appropriate.

c. Lighting
Enough lighting is necessary to maintain approximately 150 foot-candles on top of a work table which is 30" above the floor.

d. Equipment Requirements
A quantity of single-needle lockstitch machines should be available for the student's use in the classroom (at least 1 machine for each 2 students). It is also recommended that, if possible, a variety of additional machines comprising as many different classes of machines as possible be made available. The school may acquire this equipment through the following sources:

(1) Available on loan from area manufacturers.
(2) Available on loan from equipment suppliers.
(3) Purchase through budgeted funds of the school.
(4) Donation from area manufacturers.

A suggested array of equipment would include:

(1) Single-needle lockstitch machines, Federal Stitch Type 301 (FST)
(2) Multi-thread chainstitch machine, FST 401
(3) Overedge machine, FST 504
(4) Buttonhole machine
(5) Button sew machine
(6) Blind stitch machine, FST 101
(7) Chairs
(8) Several 4' sections of cutting table for possible cutting and/or display
(9) Needle guards for each machine
(10) Behind the foot spring thread cutters for single-needle machine
(11) The different gauges and folders discussed in the unit on gauges and folders

Several other items of equipment may also be required. These are:

(1) Desks -
A desk and file cabinets should be provided for the instructor.

(2) Bulletin Boards -
Bulletin boards are convenient for the maintenance and display of performance records for each student.

e. Miscellaneous Supplies and Equipment

Local industry in the area may be consulted for quantities and/or revisions to the following needs.

(1) Sufficient fabric cut to size (4" x 8")

(2) One stopwatch with 1/100 min. and 1/5 sec. calibrations (for instructor)

Model #214
Meylan Stopwatch Corp.
204 West 40th Street
New York, New York

(3) One stop clock with 10" dial (This is not a necessary item but is recommended, as it can be used to time an entire class and would be visible to all students.)

Model #W-60-ER
Meylan Stopwatch Corp.
204 West 40th Street
New York, New York

(4) One 4" dial stop clock for each student

Model #165
Meylan Stopwatch Corp.
204 West 40th Street
New York, New York

(5) Each student should supply her own scissors (medium). The institution sponsoring the course should have several pairs on hand for purchase by the student.

(6) Thread. A minimum of 2 cones for each machine should be available at all times. This should be a cotton thread, Size 70/2 cord, color natural, available from any thread supplier.

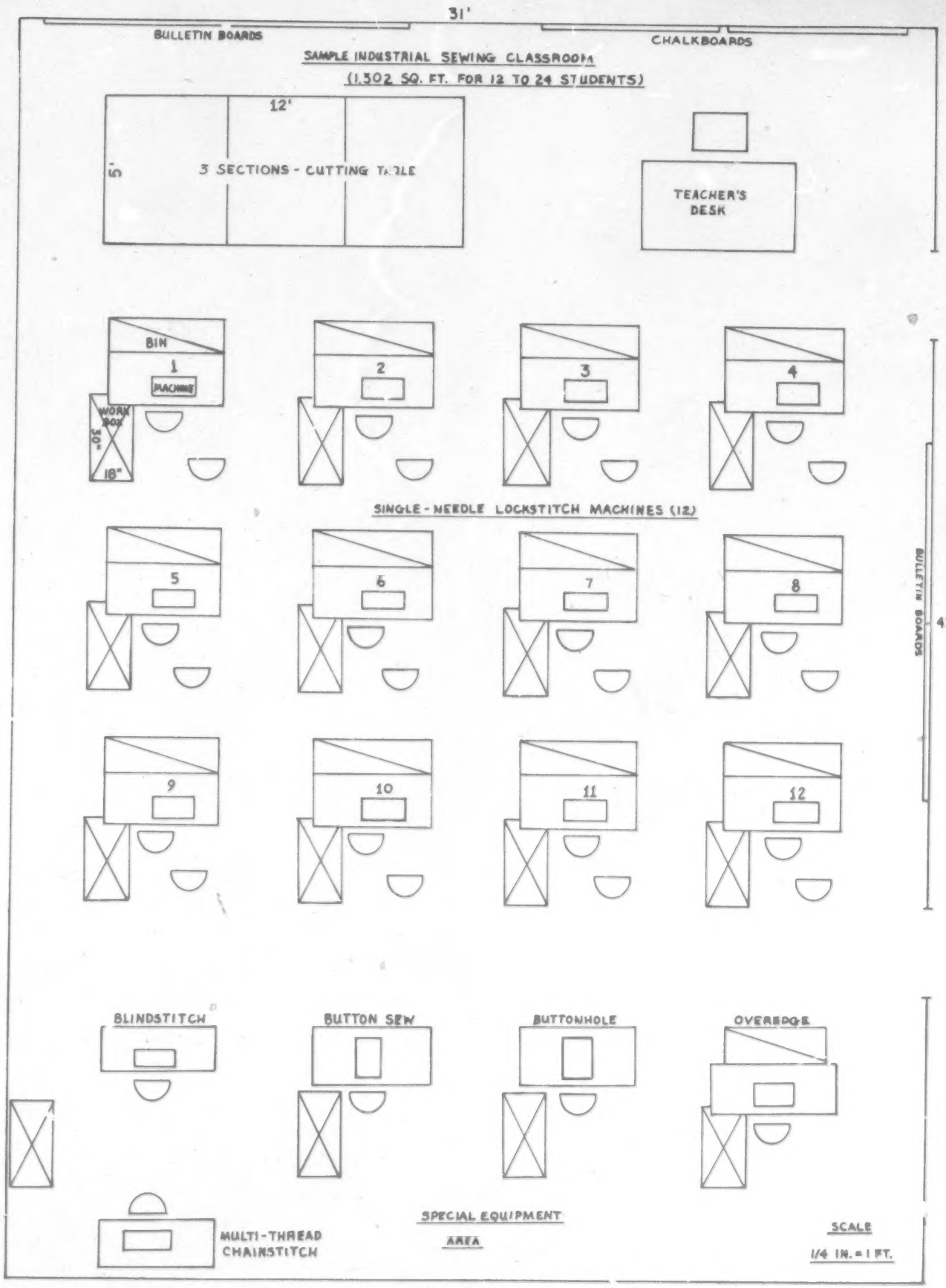
(7) Inexpensive small calculator for the instructor to compute percentage performance

f. Selection of Instructor

In the selection of an instructor for industrial sewing, local apparel plants may be able to help with suggestions for qualified candidates. In most geographical areas it is possible to form a program advisory committee from among the apparel industries within the community.

g. Examinations

Examinations should be given at the end of each unit, covering points discussed in the text.


31'
BULLETIN BOARDS
CHALKBOARDS
SAMPLE INDUSTRIAL SEWING CLASSROOM
(1,302 SQ. FT. FOR 12 TO 24 STUDENTS)
12'
5'
3 SECTIONS - CUTTING TABLE
TEACHER'S DESK
BIN
1
MACHINE
WORK BOX
30"
18"
2
3
4
SINGLE-NEEDLE LOCKSTITCH MACHINES (12)
5
6
7
8
9
10
11
12
BULLETIN BOARDS
42'
BLINDSTITCH
BUTTON SEW
BUTTONHOLE
OVEREDGE
MULTI-THREAD CHAINSTITCH
SPECIAL EQUIPMENT
AREA
SCALE
1/4 IN. = 1 FT.